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Hon. Bette Stephenson, M.D., Minister
Dr. H.K. Fisher, Deputy Minister

Curriculum Ideas for Teachers 1980

This support document to *The Formative Years*, one of a series dealing with the conservation of energy, provides information, student material, and suggestions to teachers for presenting this topic in the Primary Division.

Eating and Energy – A Part of Every Day

Energy
P2

Contents

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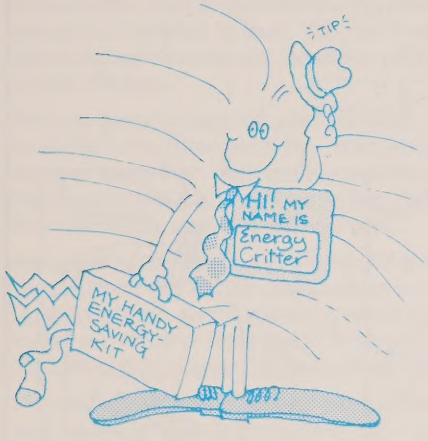
Introduction

This document was prepared to assist teachers and students with the study of energy. To make this topic "real" for children, the units were developed using the themes that are most relevant to a child's everyday life experiences. The themes, all basic needs of life – food, water, shelter, clothing, and transportation – incorporate energy concepts that relate to the satisfying of these needs. Several activity sets also include values related to lifestyles and ideas related to electricity.

Each activity set is designed to increase the "energy consciousness" of students and to assist them in formulating ideas and patterns of behaviour related to the conservation and effective use of energy.



Food is a basic necessity of all forms of life and one of the most important components of a child's daily life. The following activity sets provide opportunities for the student to better understand how the satisfaction of food needs depends on the expenditure of energy. At times, the energy referred to will be the physical human energy used to run machinery or to package, process, store, market, advertise, or deliver a food product to consumers. At other times the energy referred to will be the nutritive value of food that is the energy source for our bodies.

The food system can be more or less complex. Our ancestors who raised, preserved, and stored their own food had a fairly simple system. The system was labour intensive and provided many staple foods. However, changes in weather conditions and the difficulty of maintaining quality growing soil and of preventing disease or insect damage often made food production unreliable. The food on our dinner tables, on the other hand, is part of a complex ecosystem that requires hundreds of individuals to perform specialized functions so that eventually we can obtain food to eat!

Ours is an industrial system. It employs energy-consuming machinery, scientific research, computers, marketing boards, fertilizers, pesticides, preservatives, natural resources, and all forms of transportation. There are many problems associated with such a highly specialized system. For example:

1. There are limits to the amount of food that can be produced on the available arable land.

2. Our technology is built and organized around a non-renewable fossil fuel base.

3. The increasing consumption of animal protein is expensive, unnecessary, and inefficient in view of the fact that proteins are readily and more cheaply available in plant material.

4. The increasing consumption of processed food that has a low-fibre, high-sugar/salt content not only is very energy-intensive, but carries with it *health* implications as well.

5. The processing, packaging, storage, transportation, advertising, and preparation of food drain resources and create waste-disposal problems faster than we can solve them.

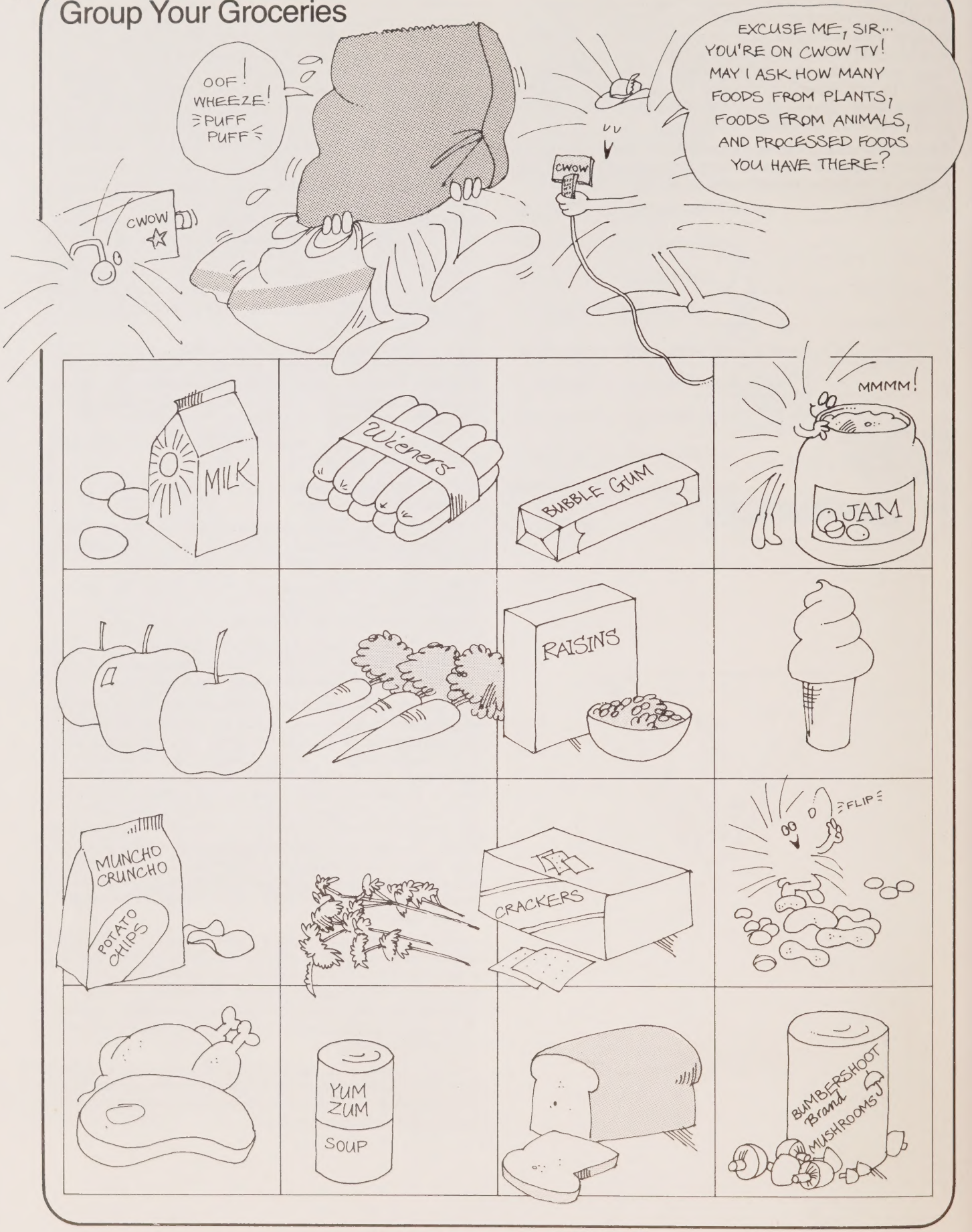
With your guidance, students can examine the inputs, outputs, and wastes in a food system and understand the "trade-offs" we accept with each decision we make. They should appreciate how important it is for us to fully consider the consequences of our choices. For example, if we select a convenience food (e.g., a TV dinner), a tremendous number of resources – food, chemicals, metal, paper, energy for cooking, energy for freezing, energy for reheating, energy for transporting – are used as inputs. The intended output is simply a quick meal! In the process, fossil fuels are consumed, escaping heat goes unused, and great quantities of solid wastes are produced. Your students can consider all of these factors and then decide what is "convenience".

People in the advertising industry realized a long time ago that children had the power to influence the demands of the market. If students understand the alternatives available to them and the energy-related aspects of these alternatives, they can influence their own and their family's buying patterns. If these choices become more and more ecologically sound, we can only profit by the effort.

The objective of the following activities is to develop in students an awareness and appreciation of each individual's role in the food system so that they will become energy-wise, energy-responsible participants in society.

Name:

Group Your Groceries



Notes

People today are faced with an ever-expanding selection of foods. These foods range from natural, organic products to those made from totally synthetic materials. This introductory activity set will allow students to examine, in a concrete way, the variety and qualities of food forms available to them so that they can fully appreciate the kinds and quantities of energy used in the food-production system. The concept of finite, non-renewable resources is also introduced in this section.

As well as coming in fresh, natural forms, foods can be endlessly processed with additional expenditures of energy. Our food choices are affected by sensory appeal, price, and availability. This introductory classification activity will allow you to observe the level of awareness and reasoning power of your students in relation to food. You can then decide which of the following activities to use, adapting where necessary to suit individual children.

Provide grocery bags for your students. Draw lines on each bag to divide it into three sections. Your students can then cut pictures of foods from their activity sheets and paste them onto the bags under the following categories: Food From Plants, Food From Animals, and Processed Food.

Have the students draw or list all of the foods that they ate on the previous day on the other side of the paper bag. Ask them questions such as the following about the foods they ate: How many were fresh? Packaged? Which were foods from animals? Plants? Which needed to be cooked? Kept in a refrigerator?

Provide a selection of foods that students can sort and classify in a variety of ways. (Include organic – grown – and non-organic – processed – foods in your selection.) They might sort according to their likes and dislikes, to things we cook and things we eat raw, or to fresh food and packaged food – the classifications are to come from the children for the most part. Students can discuss their reasons for particular groupings.

Encourage the children to discuss and continue to refine their classifications. For example, they might place all boxed foods in one group and all canned foods in another. These two groups might be further reclassified into four – boxed soups, boxed cereals, canned fruit, and canned vegetables.

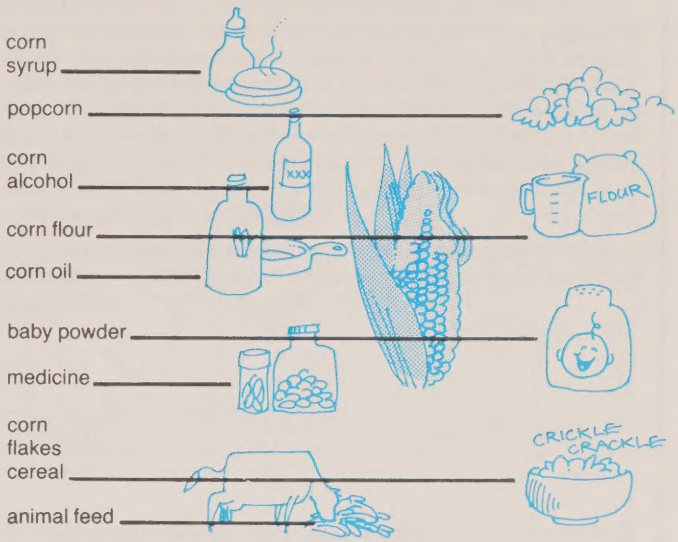
Follow-up Activities

1. Help students understand the very real fact that food supplies are finite. Use a handful of peanuts or an apple to draw an analogy. The peanuts can represent the world's food supply. Some people get more than others (give some students one or two peanuts), and some don't get enough (don't give any peanuts to one group). Explain that even with all the scientists and farmers working together, we still can't provide food to some people in the world. Discuss spoilage, systems of sharing and transporting, and the problems of hungry people.

Explain that some countries give their surplus food to other places in the world where the people aren't able to grow enough food for themselves. For example, Canada has sent grain, powdered eggs, and powdered milk to needy countries. Be careful. This exercise is not meant to make children feel guilty or somehow responsible for starvation on the planet, but only to illustrate briefly a fact of life which, perhaps through their generation's wisdom, can be improved.

2. Have students examine, describe, and identify samples of different grains in bowls. Wheat, corn, and rice are the most important, but you might like to extend this activity to include oats, barley, rye, and even soya beans and legumes. Have your students visually link products to a particular cereal grain. (They might use pictures of grains or the real thing.) They can thus understand how one grain is related to its products.

Figure P2.1: Products Made From Corn



3. Have your students record all of the things they did one day (e.g., on Saturday). Write down one student's responses on a chart as he/she dictates. The class can then identify the forms of energy that were needed to do the different activities. *All* of the activities will use food or body energy. Some activities will require other fuels too, such as oil, coal, and electricity.

Related Ideas

1. Set up a centre with books and filmstrips about corn – our gift from the Indians. The books will illustrate how people used corn in the past, and how our techniques of production and storage were developed and refined.

2. The Indians had an energy-conserving means of growing the ingredients for succotash. They simply planted bean seeds in soil beside sprouting corn and, as the bean vines grew, they entwined themselves around the tall growing stalks of corn! Your class can try this protein-rich, meatless stew by following this recipe:

Ingredients: 185 mL milk
30 mL flour
30 mL butter or margarine
15 mL salt
pepper
sugar
375 mL cooked fresh or frozen corn
375 mL cooked fresh or frozen lima beans
(Add any other cooked vegetables to the mixture.)

Combine milk and flour until smooth. Add butter and heat, beating constantly with a wire whisk until mixture thickens. Add seasonings. Add cooked corn and beans. Heat through gently without boiling. Serve.

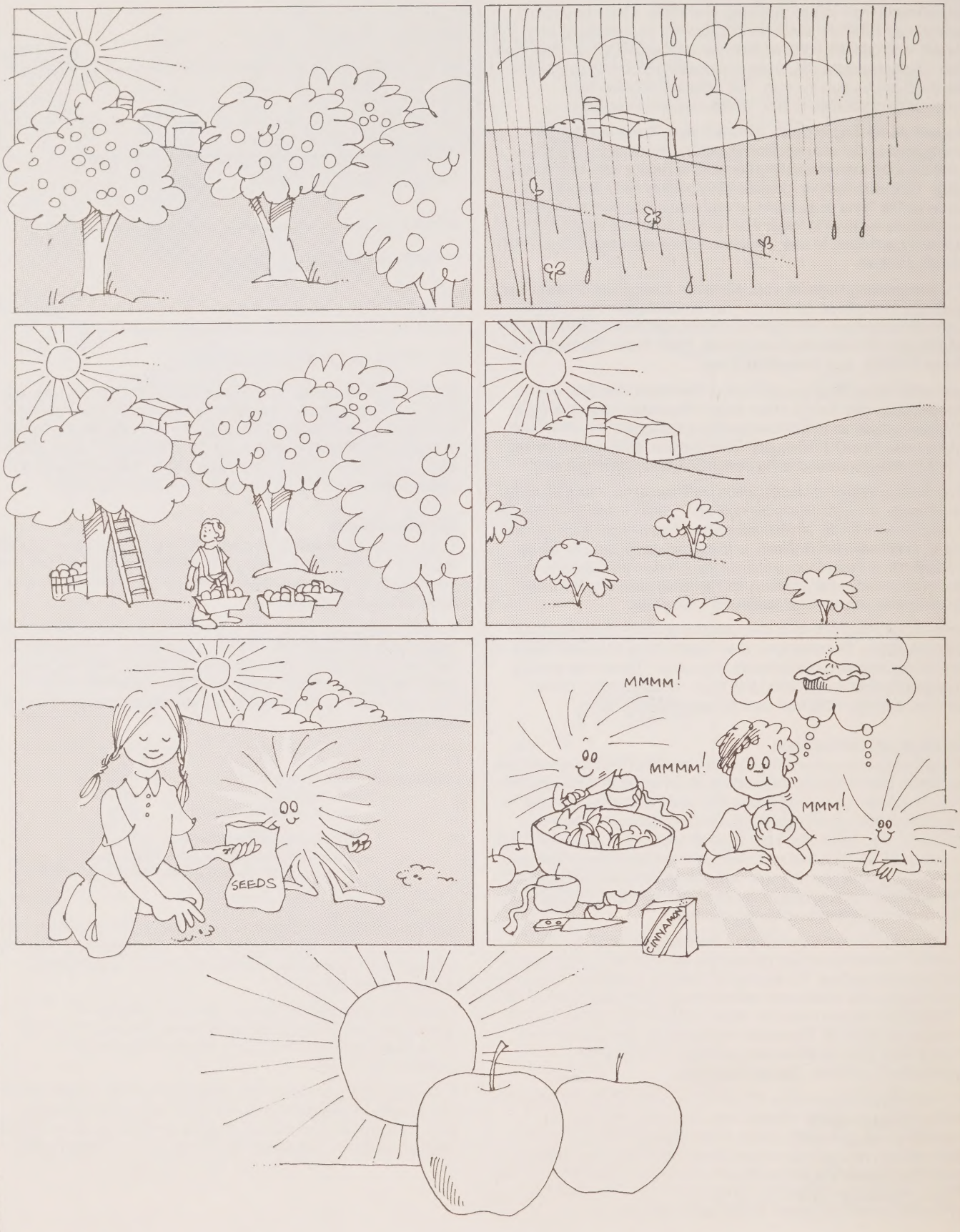
Source: Adapted from Lila Perl, *Slumps, Grunts and Snickerdoodles: What Colonial America Ate and Why* (New York: Seabury Press, 1975), pp. 27-28. Reprinted by permission.

3. Discuss with your class the dangers of eating certain plants and substances in the home and in the outside environment (e.g., poisonous mushrooms, poisonous plants such as dieffenbachia, narcissus, oleander, lily of the valley, and mistletoe).

Name:

6

Thank You, Sun!



Notes

No food, whether intended for animals or humans, will grow without the sun's energy (or a substitute). Plants use, or convert, this energy in order to grow. This activity set will provide opportunities for students to observe a natural energy-conversion system.

Primary students should be able to grasp a simplified explanation of the concept of the food chain. Plant and animal needs are all interrelated and dependent on each other. Sun energy warms our earth, provides the conditions for plant photosynthesis to occur, and interlocks with the water cycle. Plants, in turn, provide animals and humans with food both directly and indirectly. Grade 3 students might examine the sun's effect on an aquatic food chain.

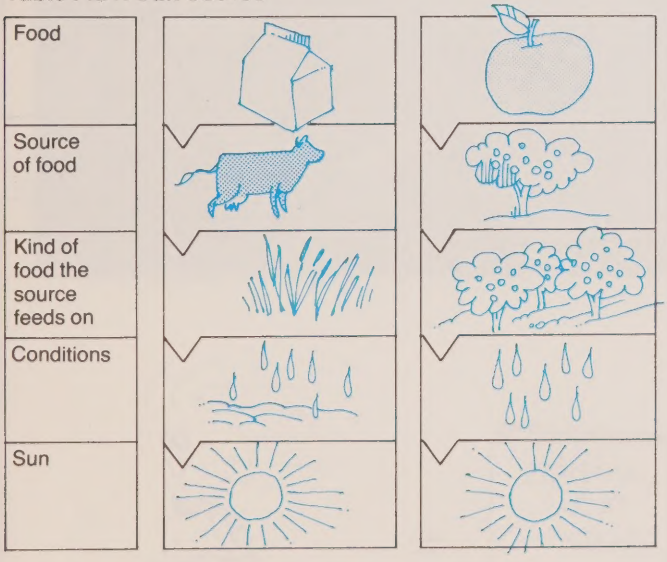
Use a selection of colourful food pictures or concrete examples of food with the children. Through questioning, attempt to trace the foods back to their original source. For example:

- pineapple slices → from a pineapple plant, which grows in the earth
- corn-on-the-cob → from a cornstalk, which grows in the earth
- raisins → from grapes → from a vine, which grows in the earth
- cereal → from grain, which grows in the earth
- turkey meat → from a bird → bird eats grain grasses, which grow in the earth
- milk → from a cow → cow eats plants, grain, and grass, which grow in the earth

After students have grasped the concept that everything we eat ultimately has been made possible through plant growth, the requirements for plant growth (i.e., water, air, soil, and sun) can be studied.

The pictures on the activity sheet can then be cut and pasted into their proper sequence. Students can use the back of their sheets to explain why we need the sun to grow our food. As an alternative, Grade 3 students could use the food they eat as concrete material for this activity.

Table P2.1: Sun Source



Plan to have all the students bring a nutritious bag lunch to school (maybe on a cold winter day). *Before* lunch, develop a sample chart, tracing foods back to the *sun* as the key energy source. (See Table P2.1 for an example.)

After the lunch-hour break, provide time for the students to draw pictures and to label a chart to show where some of the foods in their lunches came from.

Follow-up Activities

1. Students can do the following experiment to see how the sun does its work: Cut openings from the sides and ends of three similar shoeboxes, leaving enough cardboard for strength. Put equal amounts of soil in the bottoms of the boxes. Put a thermometer on the soil in each box. Cover one box with plastic wrap. Put two boxes in a sunny place that is sheltered from the wind. Put one box where there will be no direct sunlight. Check the temperature of the soil in each box before and after a one-hour period. Discuss any changes and how temperature change can help plant growth.

2. a) Soak some lima beans overnight. In the morning have your students peel them open to discover the easily seen miniature plant inside.

b) Have your students each bring to school and eat a piece of fruit (for recess). They should save and then plant the core, pit, or seeds. Focus some attention on the plant's requirements for growth (i.e., air, water, sun, and soil). If your students eat their fruit in class, take advantage of this opportunity to develop their vocabulary. They can use descriptive language to express all their sensory reactions to their fruit.

3. a) Trace one locally produced food from its source to our homes, focusing on all the energy-consuming transportation methods involved. For example, turkeys are taken by truck from the farm to a processing plant, then by refrigerated truck to a cold-storage warehouse and then on to grocery stores, and later by family vehicles to our homes.

b) Trace one food from another part of the world. (The use of a globe will help children figure out transportation modes.) Examine rail, ship, and truck methods of shipping (i) Hawaiian pineapples to Canada or (ii) Canadian wheat overseas.

Related Ideas

1. Ask your students what parts of plants we eat. Tell them the names that are given to plant parts and give them several examples of foods we eat for each part. For example, we eat the flowers of broccoli and cauliflower.

2. Use the story of "Jack and the Beanstalk" as an introduction. Ask your students to think of and describe foods that have magical properties. Ask them what they would be able to do if they ate the food. (Examples are bionic bread, mini-milk, and stretch strawberries.)

3. Have your students make pictures or bar graphs of the foods eaten for lunch at school. Ask them to find the most common food and to determine what energy is needed to make and then to transport it.

4. Have your students plant seeds and allow them to germinate. Some of the plants should be placed in a dark place and the rest in sunlight. Perhaps some of the students can predict the outcomes. (Which plants look the healthiest? What does the sun's energy do for the plants? Will the plants bend towards the sunlight when turned to various positions?)

Reference

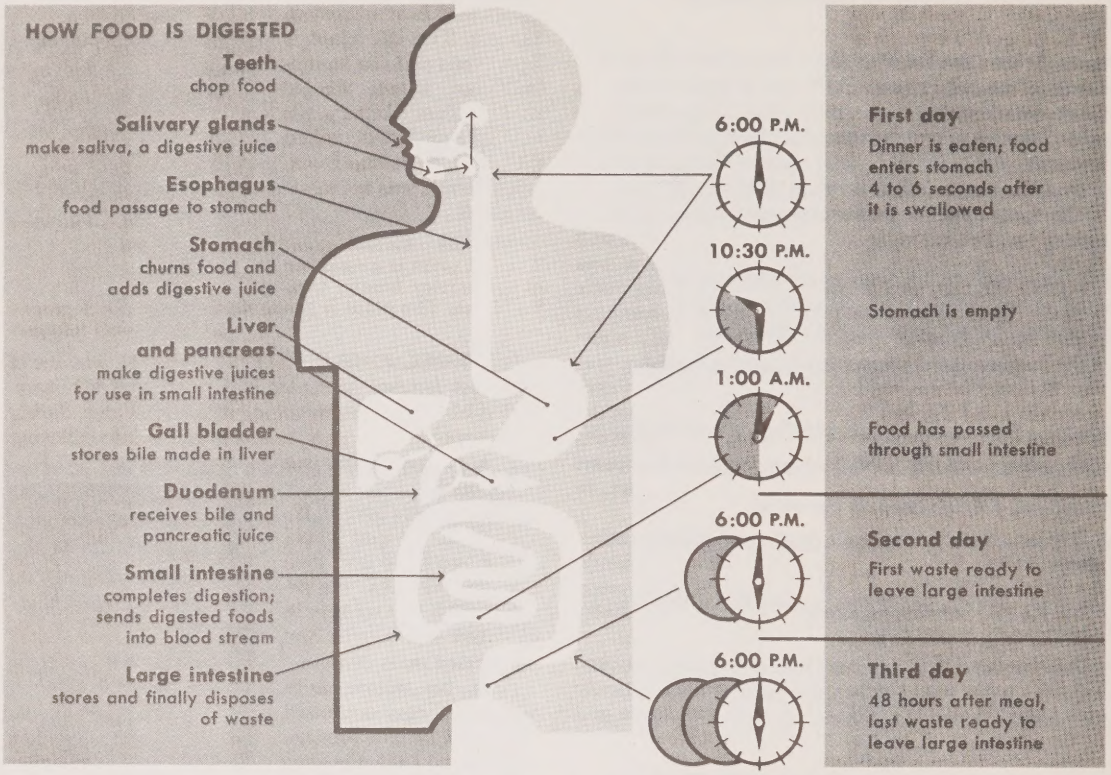
Free publications on most food industries (in bulk quantities if desired) are available to teachers only from Agriculture Canada in Ottawa.

Name:

8

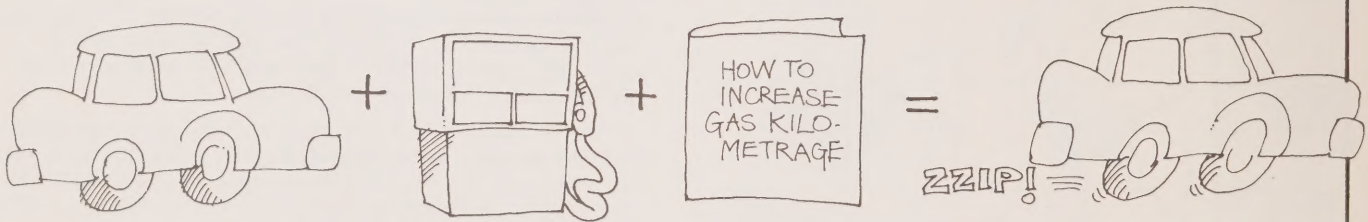
Body Energy

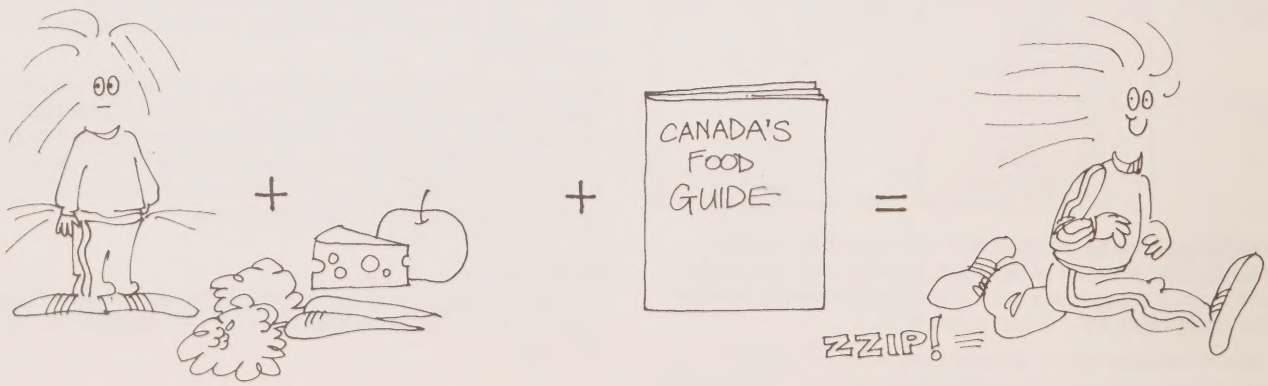
What happens to food when you eat it?



Source: World Book Encyclopedia (Chicago: Field Enterprises Educational Corporation, 1973), p. 167.

Energy Systems: How are they alike?





Notes

In this activity set, students will examine basic digestive processes and nutrition. They will become aware of the body as an energy system with requirements and wastes and will be exposed to the basic food groups from Canada's Food Guide.

> For children, the environment begins with themselves. It is axiomatic to say that children's capacity to function zestfully and even constructively in their environment depends on their health and vigour. It is essential, therefore, that they acquire some basic understanding of health practices and healthy living.

Source: Ontario Ministry of Education, *Education in the Primary and Junior Divisions* (Toronto: Ministry of Education, Ontario, 1975), p. 99.

This activity set focuses on the major body parts and the mechanisms that allow the body to be nourished and therefore develop. Students should grasp the idea that even though each body part has a particular function, the body works as a unit or system. A discussion on the flow of liquid and solid food through the body pathways might give rise to questions such as "Why do we perspire on hot days?", "What other times do we perspire?", and "Why do we get hungry?".

The necessity of understanding good nutrition is becoming more crucial to young people with the increased marketing of nutritionally "empty" foods.

To ensure that healthy eating habits are established during childhood, parents and educators should help students learn how to meet their daily nutrient requirements.

Good nutrition depends on a balanced diet, including vitamins and minerals, and on appetite and eating habits. The central principle of Canada's Food Guide is *variety* – the selection of a variety of foods from a variety of food groups which contribute a variety of nutrients. Even preschoolers can successfully learn which foods are in each group, what nutrients they contain, and how to combine them for good nutrition. (See Canada's Food Guide in the appendix.) As well, your students should understand the value of eating moderately. This idea can be clarified through a discussion on how the body stores extra food.

Although the concepts dealt with in this activity set cannot be experienced or illustrated first-hand, simulations and observations of animals and plants in their own environments will help clarify the ideas presented.

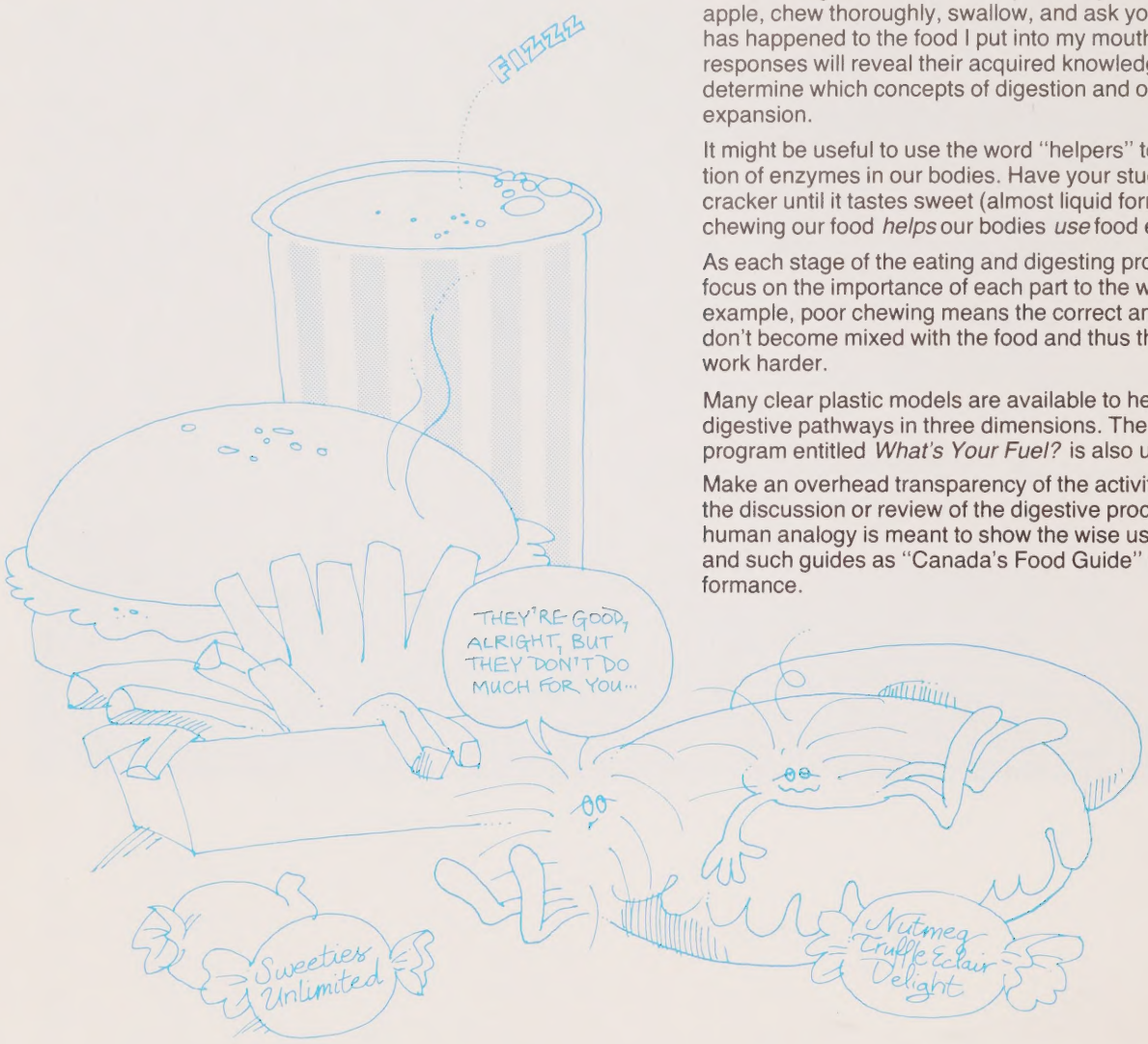
Before using the student activity sheet, you might bite into an apple, chew thoroughly, swallow, and ask your students: "What has happened to the food I put into my mouth?" Children's responses will reveal their acquired knowledge and help you determine which concepts of digestion and of body energy need expansion.

It might be useful to use the word "helpers" to illustrate the function of enzymes in our bodies. Have your students chew a cracker until it tastes sweet (almost liquid form). Ask them why chewing our food *helps* our bodies *use* food energy.

As each stage of the eating and digesting process is discussed, focus on the importance of each part to the whole process. For example, poor chewing means the correct amount of helpers don't become mixed with the food and thus the stomach must work harder.

Many clear plastic models are available to help children see the digestive pathways in three dimensions. The OECA television program entitled *What's Your Fuel?* is also useful in this regard.

Make an overhead transparency of the activity sheet to aid in the discussion or review of the digestive process. The car-human analogy is meant to show the wise use of proper fuel and such guides as "Canada's Food Guide" to get the best performance.



Follow-up Activities

1. The foods we eat are changed from solid materials to small particles in liquid that can be transported through the stomach and the intestinal walls, into the blood, and to the body cells. Undigested food is stored in the large intestine until it is expelled. The different parts of the body that are involved in this process can be simulated as follows:
a) *teeth and mouth.* Crush a soda cracker and add a little water in a small jar.
b) *the stomach.* Add more water and crushed bits of cracker to a jar. Shake vigorously for five minutes or until there is a thickened solution.
c) *the passage of particles through the walls of the small intestine.* Pour the solution through layers of cheesecloth. The children will see the cloudy appearance of the water, which is like the minute food parts in our blood.

2. Consider using the simple technique described below with your class to demonstrate how we can test for body reactions to foods. Many allergies can be discerned by noting the reaction of certain muscles when a particular food is chewed for a few minutes.

Stand facing the person you will test. The person to be tested holds one arm up straight forward, level with the shoulder, palm out and thumb toward the feet. The "tester" person applies slight pressure on the forearm (near the wrist) to pull the arm down toward the feet. Pressure is applied for two to five seconds while the other person tries his/her best to resist. The arm will reflex back when pressure is released. Test is to be done to both arms, individually. Now, ask the person to chew a particular food for a moment and *hold* in the mouth as you repeat the muscle test.

Try these foods, rinsing between: apple, soda cracker or cookie, rye cracker (no additives or sugar), cheese, pop or coffee. (Use both nutritious and junk foods.)

Source: Adapted from John Thie and Mary Marks, *Touch for Health* (Marina del Rey, Calif.: De Vorss and Co., 1973). Reprinted by permission.

Related Idea

Students can prove that food has energy by observing you do the following experiment: Spear a peanut or walnut with a needle. Light the nut with a match, and hold it under a tablespoon filled with water. Students may be surprised at the heat (energy) contained in one peanut.

References

Energy, Mines and Resources Canada. *Superkids.* Ottawa: Publishing Centre, Supply and Services Canada, 1976.

Thie, John, and Marks, Mary. *Touch for Health.* Marina del Rey, Calif.: De Vorss and Co., 1973.

What's Your Fuel? All About You. OECA, BPN 108905. Colour, 15 min. Expiry date: August 31, 1981.

Name:

People Power

Notes

Many community workers provide services in the food industry that go unnoticed. These activities focus on some of the "people-intensive" occupations that are vital to our food system.

People who settled in Canada grew, raised, and stored their own food supply with a minimum of outside assistance. Our present world has developed a goods-and-services system that manages our food for us. Farms have increased in size and utilize expensive, energy-consuming machinery. The replacement of human muscle power by animal power and then by machines dramatically increased productivity. Related jobs, which assist the farmer, are constantly developing as agricultural tasks become more and more specialized.

Support systems that process, package, store, and transport foods utilize human as well as fossil fuel energy. The following activities are meant to focus primarily on all the "hidden helpers" in our complex food system.

Direct questions to the students about the activity sheet. Discuss what the people are doing, and why a particular job is necessary. Ask students what energy sources the people in the pictures are working with (food energy, gas, electricity).

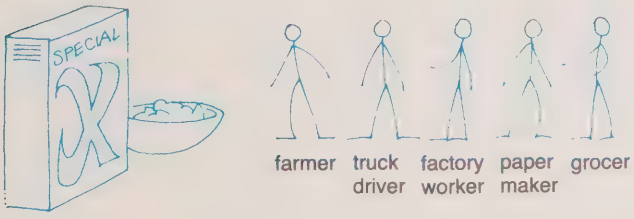
Have your students interview people who work in a grocery store about their duties. They can visit the store, observe these people at work, and discuss with the workers the specific skills required by their jobs.

You can ask your students to draw on the backs of their sheets one more helper who brings their food to them (e.g., a parent, shopping or unloading the family car).

Follow-up Activities

1. Use pictures of some commonly eaten breakfast foods as a starting point to discuss the people and jobs required to bring us our food. Milk, toast, maple syrup, and juice are possible foods to explore in this manner.

Figure P2.2



An illustration like the accompanying one can be used to focus this activity. Occupational labels can be placed below each figure in the illustration.

2. Take ten minutes each day to chart the foods eaten for breakfast by both you and your students. Encourage truthful responses and record them without comment on a chart like the following:

Table P2.2: Our Breakfast

Our Names	Juice	Milk	Egg(s)	Bread	Buns	Cheese	Cake	Fruit	Jam	Cereal	Other
Peter	✓✓✓✓✓	✓✓✓✓		✓✓✓			✓	✓	✓✓✓	✓✓✓✓	
Pam								✓✓			
Jody											
Tania											

After several days, discuss the chart with the children in the following ways:

a) Look for the most commonly eaten food – perhaps bread. Use this food to help students appreciate *quantities.* Students could calculate, for example, that: If our class eats forty slices of bread each day for breakfast and every other class in the school eats forty slices, then our school would be eating _____ slices every day for breakfast! Our school would eat _____slices of bread for breakfast each week and _____slices of bread for breakfast each month.
Consider the people involved to produce just one loaf of bread. Multiplied many times over, it means that the work of a great many people is required to produce that much bread.

b) Look for foods that are nutritious, but less energy-intensive than others. For example, whole-grain porridge can be substituted for processed cereal and in-season fresh fruit for jams and jellies (which also contain sugar). Discuss the importance of breakfast nourishment (to break fasting and to provide morning energy).

Design with the class a "beautiful" breakfast using nutritious foods that will help them get a good start to the day. Remember to use some foods that don't require high amounts of energy. Leftovers should also be used. Have the students draw and cut out pictures of this ideal breakfast and paste them onto a paper plate to display.

3. Examine the techniques that the food industry uses to promote foods (e.g., advertising, packaging, shelf placement of foods, special offers, dyeing foods, artificially ripening foods, etc.). What can your students do about these techniques? Possible action plans could be discussed that would provide students with opportunities to discuss and express their concerns. Students might be able to describe ways of taking full advantage of special offers, or weekly grocery ads.

Related Ideas

1. Have your students study a worker in the food industry (e.g., baker, dairy worker).

2. Have your students try some alternative breakfasts, perhaps as morning snacks. Here is a recipe that can be used in schools:

A Stirring Breakfast (very nutritious)

1 egg	500 mL milk
250 mL chopped dates	pinch of salt
1 cut-up banana	5 mL vanilla
15 mL honey	30 mL high-protein powder

Stir egg and dates together until smooth. Add banana, honey, and part of milk, and stir again until smooth. Add remaining ingredients and stir together. Enjoy!

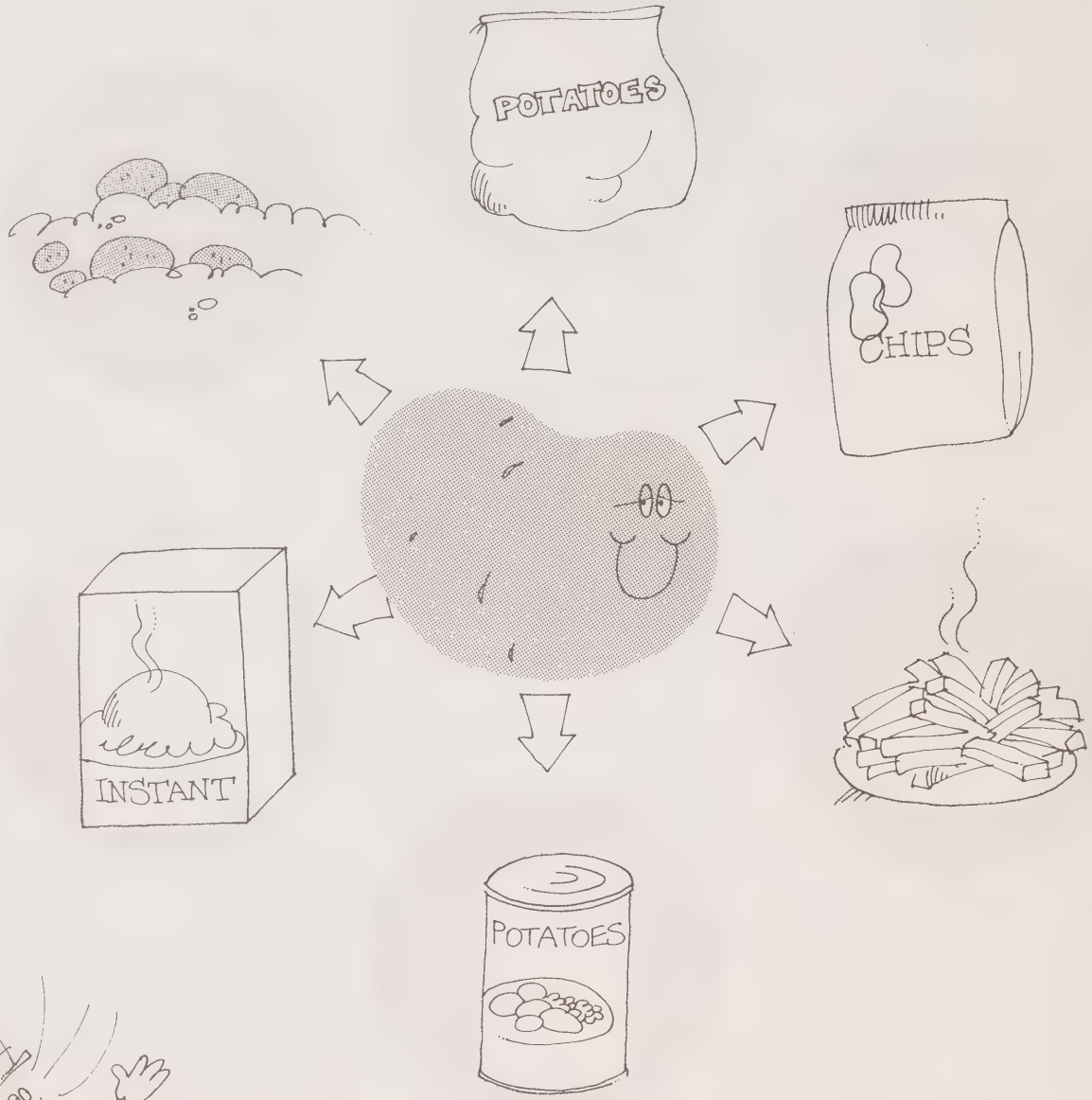
3. Enrich your students' vocabulary by introducing such terms as "producer", "consumer", "goods", and "services" through the use of the following pictures.

Figure P2.3:
Systems Vocabulary Pictures

Name:

Changes and Choices

How do we change plant foods?
What energy is used?



On the back of this sheet, draw another energy wheel showing different forms of another plant food.

Notes

Energy is used when any natural food is altered or changed. The more complex the change, the more energy-intensive is the conversion. Students should realize that foods are available in a variety of forms. Through the following activities they will be asked to consider why we alter foods. Some of the steps or stages that a food undergoes in taking on its new form will be discussed. Students should also develop an appreciation for the nutritional value of fresh foods and learn how to select "real" foods for their diets.

We live and function in an automated, specialized world where needs are satisfied through the services and products of others in the community. Only a small proportion of the population maintains a direct relationship with nature in the production and storage of its own food supply.

Many students think of a vending machine or a refrigerator as a food supplier without realizing the energy expenditures that have occurred to satisfy their food demands. Through the use of concrete examples or illustrations, students can begin to consider the physical energy and the electrical or fossil fuel energy, as well as the materials, chemicals, labelling, advertising, and transporting factors that are all components of a food-supply system. The activities in this and the following sections should extend student awareness of the input required to change foods from natural to manufactured forms. In this way, they will become more capable in making their own food selections and will have some influence on their parents' buying decisions.

Your students might start by considering all of the forms we've created for the apple (e.g., apple rings, applesauce, frozen apple pie, dried apples, candied apples). You can briefly point out the cooking, canning, packaging, transporting, and freezing processes as your students examine and eat the different forms. Ask them questions about additives such as sugar or colour (characteristics that are easily identified), and have them discuss the advantages and disadvantages of the changed form over the fresh fruit. For example, dried apples might be a preferred survival food for a camping trip (light, won't spoil, nutritious, easily combined with nuts and grains).

Through their discussions, students will become aware of the "trade-offs" we make when we select a product. If we choose fresh apples, we gain the benefit of the whole, natural fruit, but fresh apples also spoil, get worms, or crush. Students will begin to see that each of their actions has consequences, and that their decisions are important.

The activity sheet can be used in the recapitulation, and students can draw pictures of a different plant and its manufactured forms on the back of it.

Follow-up Activities

1. Have students examine their cupboards, freezers, and refrigerators (briefly) to identify plant foods that have been changed for our use. Students can list ten items to consider in class. Have them discuss the following questions:

- Why do we change the final form of certain plant foods?
- Do some changes make a food more useful? Name some examples.
- Give examples of changes that are unnecessary and that waste energy.
- Which "changed" foods are you able to avoid? For example, do we need to buy instant potatoes or can we avoid this form?

2. Sprouts are one of the most nutritious foods available to us and require very little energy to produce. Try this sprouting activity with your class. You can use alfalfa seeds, wheat seeds, lentils, or radish seeds.

How to Sprout

a) Materials:

- mung beans (available at all health food stores and Chinese grocery stores)
- a large glass jar for class demonstration, or individual clear containers if students will be sprouting seeds
- cheesecloth to cover container opening
- elastics to hold cheesecloth in place

b) Method:

- Soak seeds overnight.
- Rinse with water and drain, twice daily, for three to five days. Keep out of direct light.
- Rinse well and eat raw or slightly cooked. All parts are good to eat.

Using Sprouts

a) Have students work in groups to plan, create, and enjoy a nutritious salad using in-season grated or chopped fruits and vegetables and sprouts. Perhaps each group can exchange samples with the other groups. The idea can be used at home and sprouts added to the next salad prepared there.

b) Sprouts can be used in making chop suey, chow mein, egg rolls, and other stir-fry dishes. Stir-frying cooks food quickly, while retaining most of the food value.

3. Have your students cut slices of apple, potato, carrot, celery, etc., calculate their mass and record these findings, and then leave the plant foods out in a warm place to dry. In a few days, when the foods have dried, have students measure the mass of each food to determine the amount of water contained in the original fresh food. The experiment can be repeated with a slice of bread or, perhaps, some junk foods. Discuss with the class how our body uses water in its system.

4. Use the surface of a desk to represent your local community and its surrounding area. Put a cluster of cubes in one place to represent your city. Add a few scattered blocks to represent farm houses. Then become a storyteller, explaining the virtues of your city; how children grow up, wish to live there, and need places to live; and how new people move into the area and need new homes. Make some parks, garbage dumps, and factories (anything that uses land), and continue adding blocks as you tell your story. When you have finished, ask your students the following questions:

- What will happen if people keep using precious farmland for other purposes? (We must be careful to leave enough land to grow some of the food we require.)
- How many of you have gardens at home? Are home gardens a good idea? Why?

Related Ideas

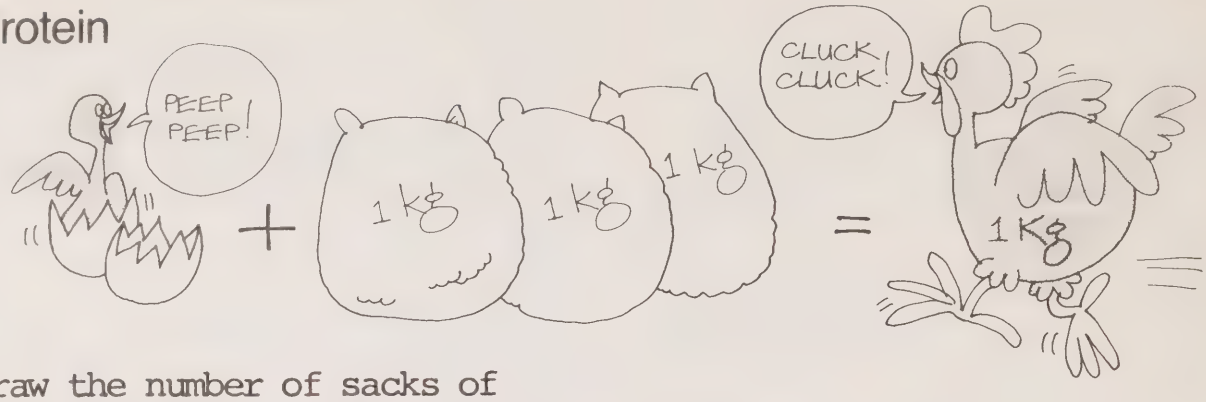
1. Teach your students how to spell some plant-part words (e.g., stem, root). They can also suggest some examples of plant parts that we eat.

2. Are all plants safe to eat? Some wild mushrooms can be eaten, and some weeds (e.g., lambsquarters) are edible. However, children should realize that many plants are poisonous. Consider some weeds and their uses as foods with your class. A good resource for this activity is *Ontario Weeds*, published in 1976 by the Ontario Ministry of Agriculture and Food. It can be purchased at a cost of $2.50 from the Publications Centre, Ministry of Government Services, 880 Bay Street, Toronto M5S 1Z8.

3. Have your students dramatize the growing process, starting from a seed and continuing until the plant reaches maturity (or until it's eaten!).

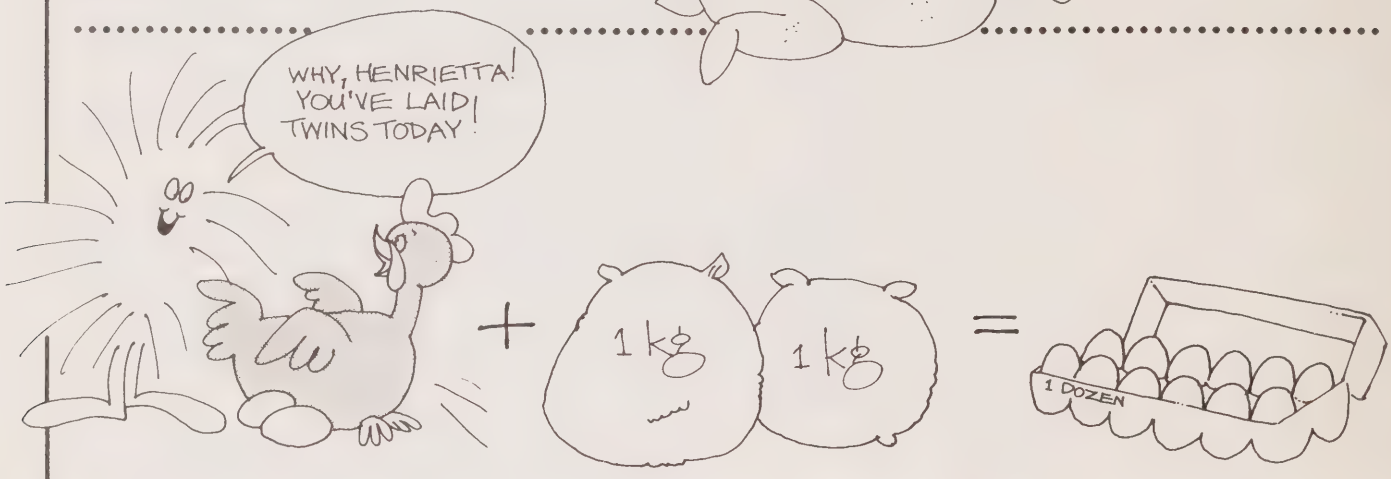
Name:

Protein



Draw the number of sacks of feed that would be required to grow this food. Use the back of the sheet.

.....



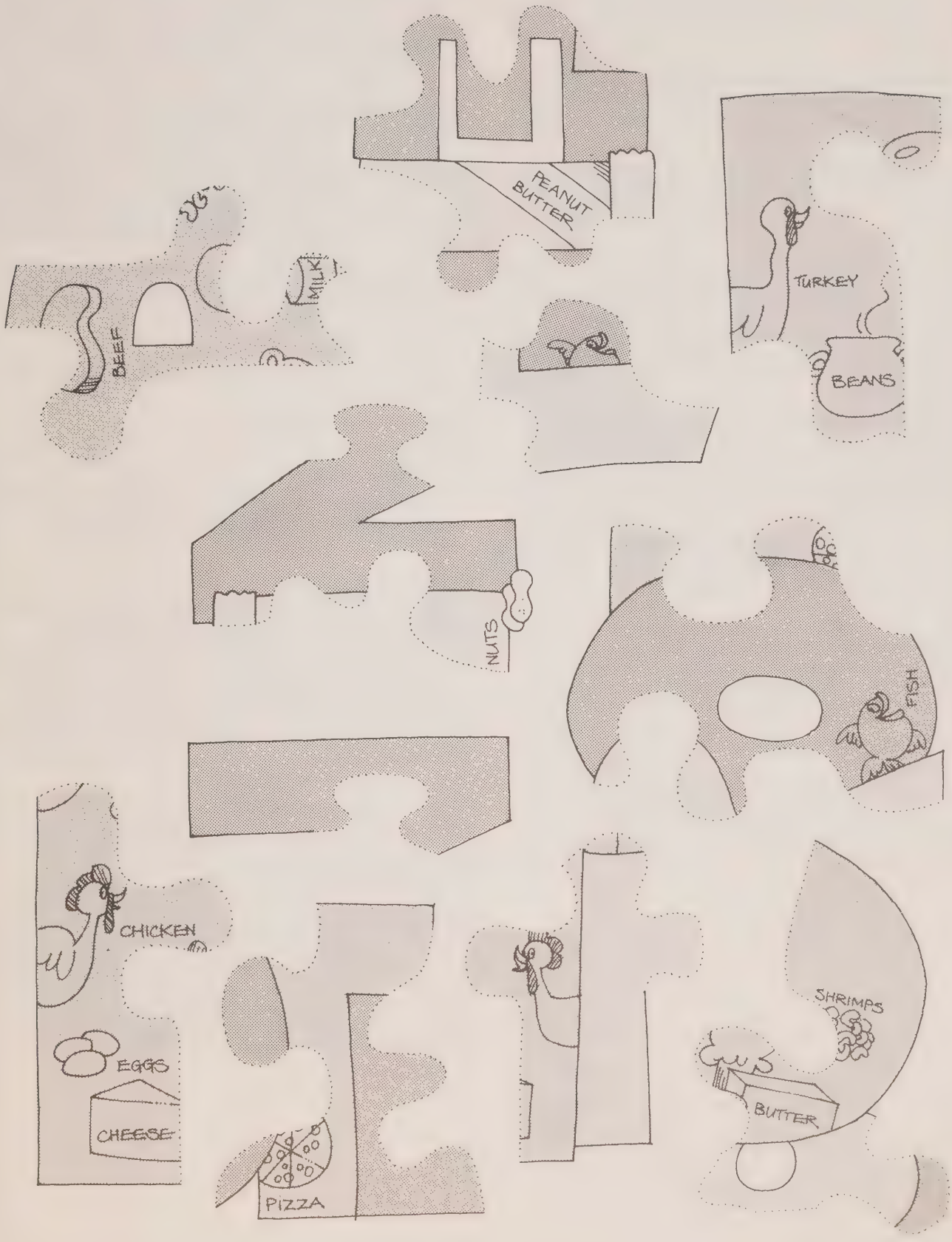
Most families use two dozen eggs a week. Show how much feed it would take to produce two dozen eggs.

.....

What work do people do so that we can have (a) turkey, (b) eggs?

Name:

Protein Puzzle



Notes

We are members of a meat-eating society. However, our protein requirements can be met by eating a wide variety of foods. In this section, students will be exposed to the many foods containing protein, and they will become more aware of the quantity of resources, both food and labour, that are required to produce animal protein.

Humans require protein, whether from plants or from animals, as part of a balanced diet. There are thousands of different kinds of proteins in the body, all of which are made up of smaller constituents called "amino acids".

According to Hal Hellman in *Feeding the World of the Future*, the average American gets 47 per cent of his/her energy from carbohydrates, 41 per cent from fats, and about 12 per cent from protein.

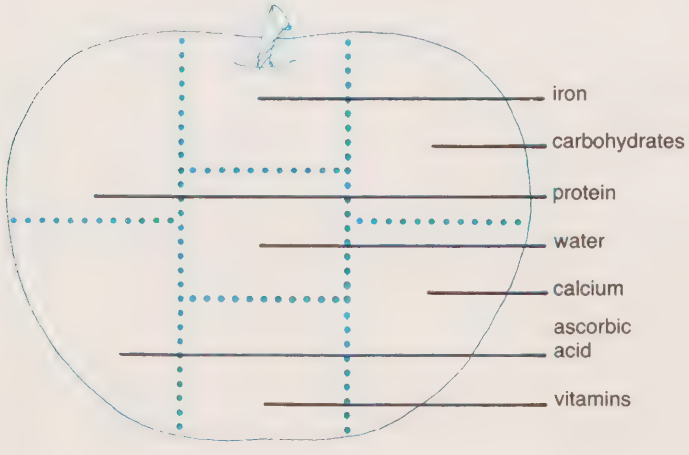
According to the usual calculation, about 0.9 g of protein is needed per kilogram of body weight per day. This can be provided by meat or by some other protein food. For a 45.5 kg person, 40 g of protein food are needed. Meat from animals generally gives us a better balance of proteins than do plants, but vegetarians around the world have learned how to create a healthy diet of plant foods by carefully balancing the different kinds of proteins.

The difficulty with animal food production is the inefficiency of the conversion from plant protein to animal protein. The conversion rate for red meat (beef) is 5:1 – less than one-fifth of the food intake of cattle is being given back as meat. Thus, meat is the most expensive part of a meal, both in cost to the consumer and in the use of arable land.

Today, farmers are finding improved ways to enrich the diets of animals by recycling animal wastes (urea, ground-up feathers, bones) and are developing animal strains with higher percentages of body protein.

Although all humans have the same basic nutritional needs, half of the world's people go hungry. The gap between the number of people alive and the available supply of food increases with every year, as does the gap between our energy demands and fuel resources. In the future, people all over the world must be encouraged to meet their protein needs by eating different food combinations and new food products that are being developed.

Draw the outline of an apple (or some other food) on the chalkboard. Use lines to make boxes inside the shape. As you explain to the class that food is composed of many nutrients or food parts that our body needs, print some of this vocabulary in the boxes (e.g., vitamins, protein, water, ascorbic acid, carbohydrates, iron, calcium).



Ask your students for the names of foods that they know contain protein. Use pictures to help them extend their list, and discuss which foods we usually eat to obtain our protein requirements.

Make an overhead transparency from the first student activity sheet (Activity Set 6) and use it to focus discussion on the quantity of plant food, land, and labour needed to produce meat forms of protein.

Show your students the amount of protein that we need each day by using some of the different food items that would provide sufficient amounts. For example, a 30 kg child needs 27 g of protein each day – approximately two pieces of pizza or 375 mL of macaroni and cheese. Note: *Nutrient Value of Some Common Foods* (see bibliography) will be useful in this regard.

The protein puzzle illustrates some sources of proteins. Children can cut out the eleven puzzle pieces that show protein foods and put them together.

Traditional diets of various cultural groups can illustrate protein teams that often include little meat. The following combinations can be discussed in class:

- Mexico: corn tortillas and beans
- India: rice and dahl (dahl is a lentil-like legume used in meatless curries)
- China: rice and soy products
- Italy: pasta and cheese
- Japan: rice and fish
- Canada: baked beans and bread, potato and egg salad, macaroni and cheese, cereal and milk, peanut butter sandwich

Follow-up Activities

1. Seeing is believing. Children will fully appreciate the energy, labour, and quantity of feed required to hatch, feed, water, clean, shelter, and raise poultry to the mature state, if they are given the opportunity to do so first-hand. Have them graph the feed consumed and the growth of the chickens. Before undertaking this activity, obtain a reliable pamphlet or book about hatching eggs, and follow all health and safety precautions outlined. When the activity is completed, you will usually find that egg producers and distributors are very often willing to take the growing chickens off your hands as well.

2. In order to get a fresh perspective on some conveniences we take for granted, obtain a fresh (butchered) chicken from a local farmer or poultry merchant. Go through the total plucking and cleaning process with the children, and discuss the energy it took. Have your students find out how our chickens are prepared for us and who provides us with these services. As an alternative to this activity, have your students compare cleaning fresh fish to buying frozen fillets. Ask them which tastes better.

3. Have your students investigate the total use of an animal (cow, pig, or fowl). Organize a visit to a meat-packing plant, and interview a butcher to find out all the uses made of the different parts of the animal. The accompanying diagram of the uses of a cow may be useful in this regard.

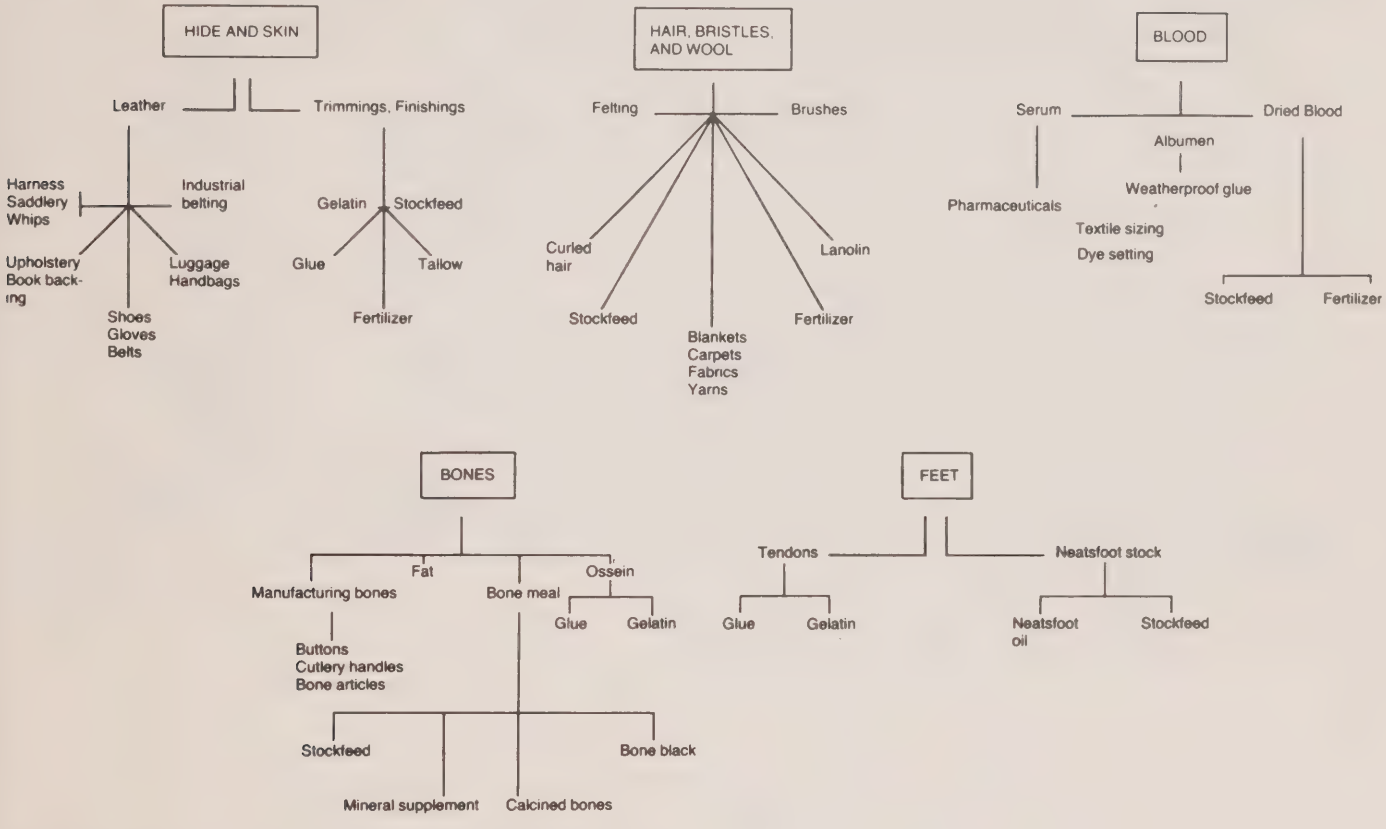
Related Ideas

1. Cook a meatless meal with your students. It is especially fun to use meat substitutes in what is ordinarily a meat dish, such as lasagne or hamburgers.

2. Feed a class using one steak, by making chop suey or chow mein. Have the children compare this demonstrated use of meat to a typical barbecue experience.

3. Fish farming is being practised in many parts of the world with great success. Have students identify the types of fish that are being produced this way and the possible applications of these techniques. (Can we grow our own seafood or trout at home? Can we use the water from a fish tank to fertilize our home gardens?) Raise brine shrimp in the class. You will need an air pump, large jar, and shrimp eggs from your local pet store. The shrimp can then be fed to aquarium fish.

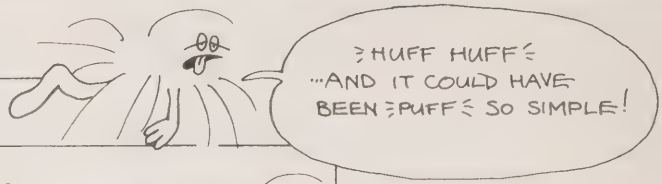
Figure P2.4: Uses of a Cow



Source: I. Mann, *Processing and Utilization of Animal By-Products* (New York: Food and Agriculture Organization, United Nations, 1962), p. 242. Reprinted by permission.

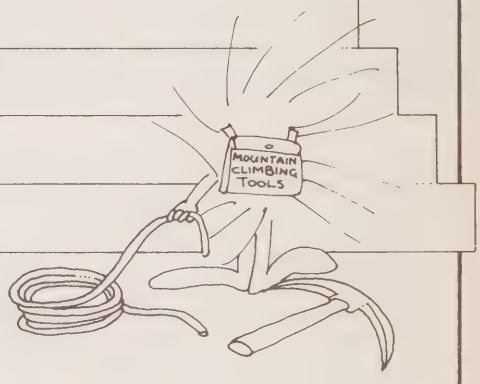
Name:

Energy Steps



13. You eat it.
12. You throw away the package.
11. You thaw it and cook it.

10. You take it home and put it in the freezer.
9. You drive to the market to buy it.
8. The market keeps it frozen.
7. A refrigerated truck takes it to market.
6. It is frozen.
5. Someone makes the package.
4. It is packaged.
3. It is sliced by machine.
2. It is transported to a processing plant.
1. Someone else grows a vegetable.



Source: Adapted from College of Home Economics, Energy Conservation in the Home, (Knoxville, Tenn.: U.S. Dept. of Energy, October 1977), p. 207.

Which energy steps could be saved?

On the back of this sheet:

1. Draw the energy steps for a can of pop. Which energy steps could be saved?

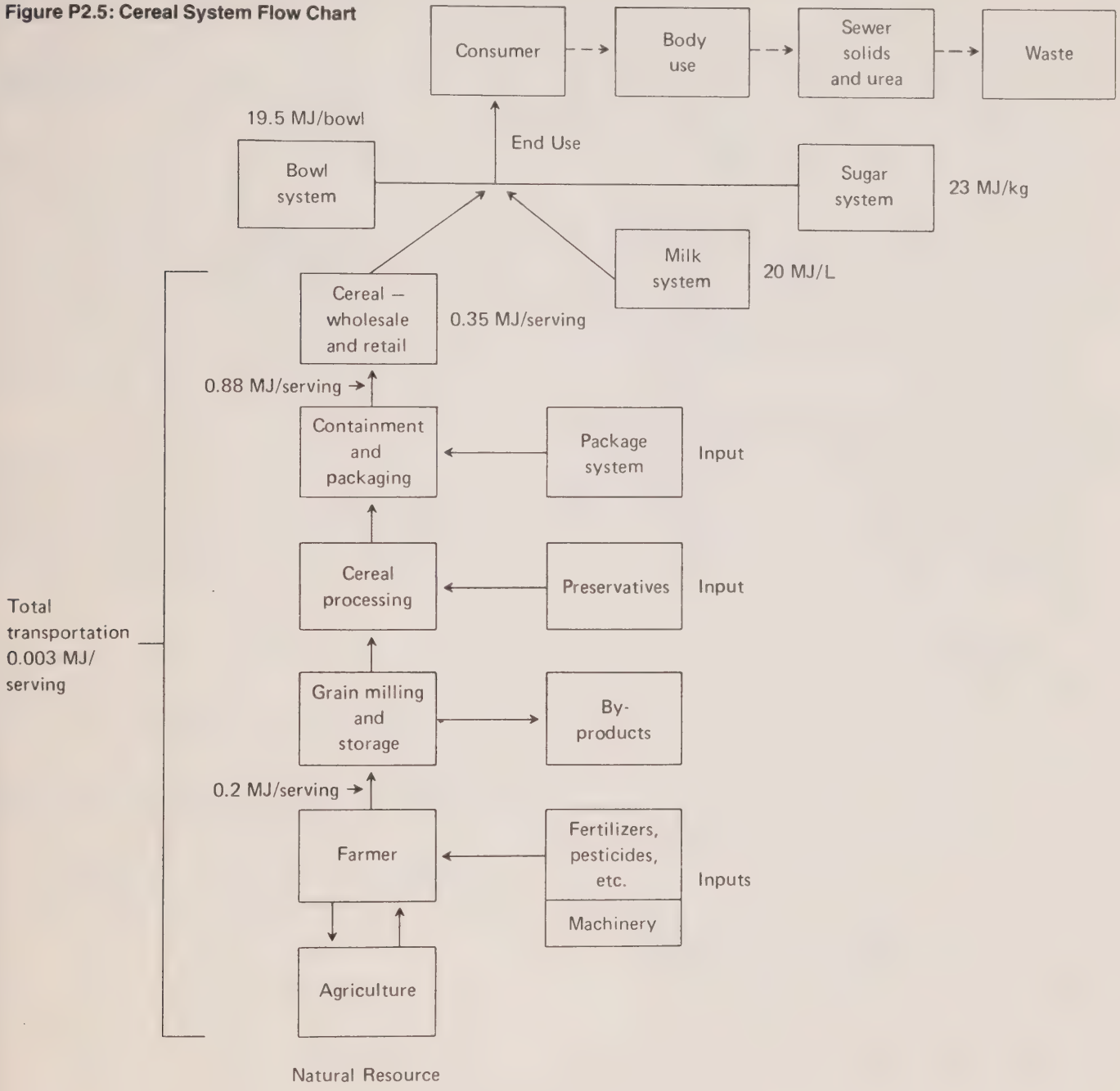
2. Draw the energy steps for some other favourite food.

Notes

Consumers have requested "convenience" foods, "time-saving" products, "instant" foods, and "snack" foods. In this activity set, students will take a close look at the food-processing industry, will attempt to identify energy-consuming steps in the production process, and will be asked to consider different ways in which energy could be saved.

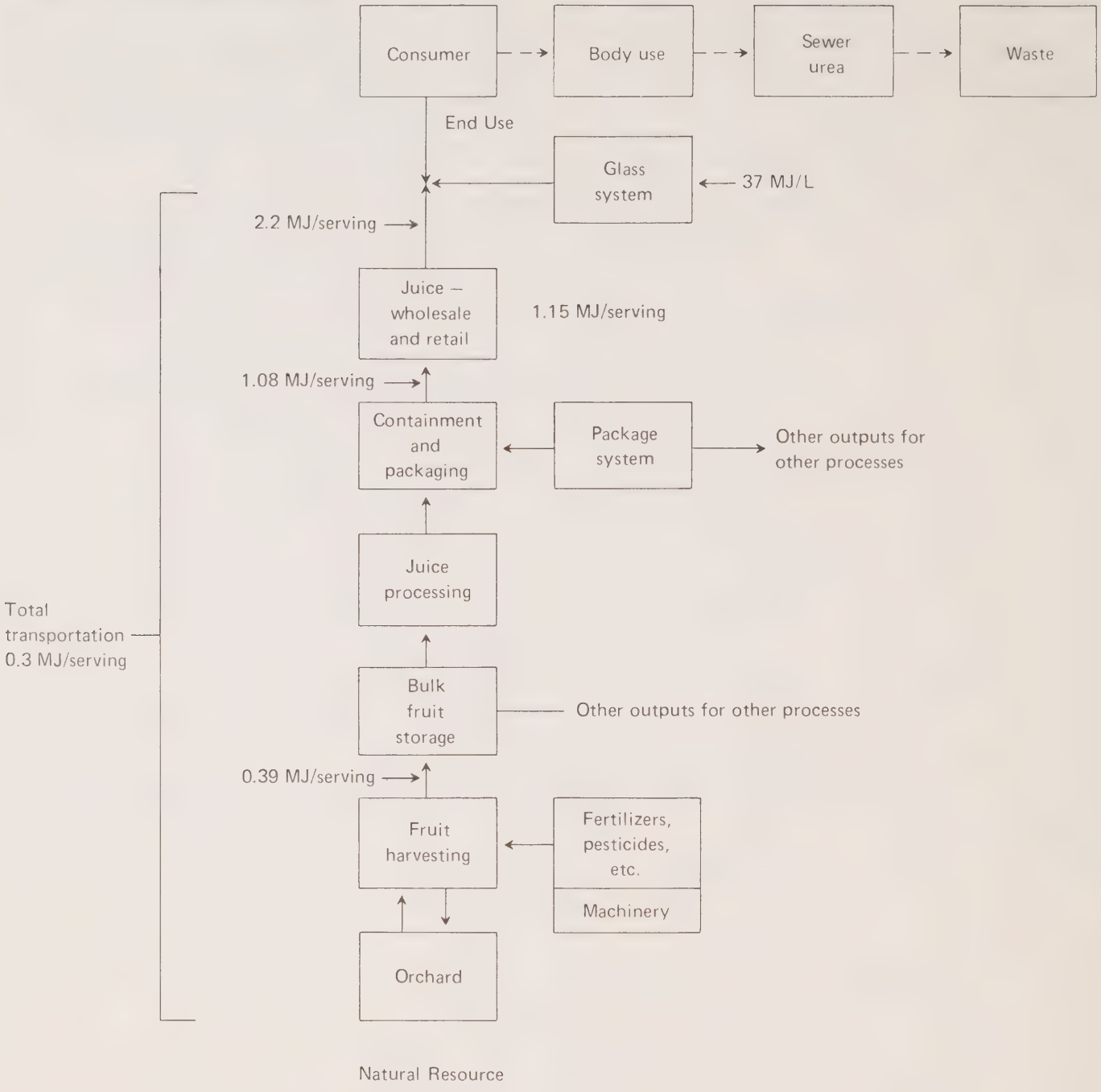
This activity set attempts to illustrate in a simplified form the materials-flow system for "processed" foods. Such a system traces the services involved in, and/or all the various ingredients of, a product from its natural state as a resource to its produced and packaged form at the point of consumption (e.g., from a cereal grain to a box of breakfast cereal or from an apple to a glass of apple juice). At every step along the way, physical energy is expended. Such factors as electrical and fossil-fuel energy, materials for packaging, advertising, transportation, and chemicals must also be included in the analysis. The following are two examples of materials-flow systems:

Figure P2.5: Cereal System Flow Chart



Source: Ontario, Ministry of Education, *Energy in Society: A Resource Guide for Teachers* (Toronto: Ministry of Education, Ontario, 1978), Part 5: Food, p. 20.

Figure P2.6: Juice System Flow Chart

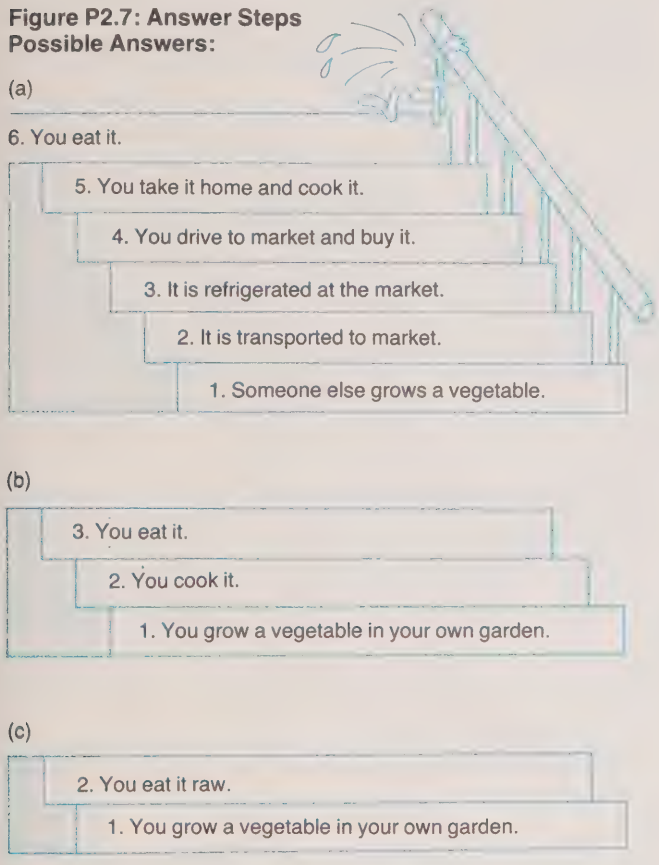


Source: Ontario, Ministry of Education, *Energy in Society: A Resource Guide for Teachers* (Toronto: Ministry of Education, 1978), Part 5: Food, p. 21.

Explore the concept of "processed" foods with your students. Use pictures or examples of both foods that are processed and foods that are not processed in order to arrive at a definition of the word "processed".

Thirteen steps in a food system are listed on the student activity sheet. This information can be generated by the class to fill in a *blank* step diagram that you can draw on chart paper. The steps can then be cut apart, and the class can decide, and justify their decisions about, which steps might be eliminated. The following are some sample answers:

Figure P2.7: Answer Steps
Possible Answers:



Source: Adapted from College of Home Economics, *Energy Conservation in the Home* (Knoxville, Tenn.: U.S. Dept. of Energy, October 1977), p. 208. Reprinted by permission.

Students can make individual books showing the food-processing industry by cutting apart their activity sheet "steps". Each step can then be pasted on a separate page and illustrated.

Follow-up Activities

1. Take your students on a visit to a local grocery store or small food store, and have them list ten foods that are processed. Alternatively, the lists can be made from the products in their cupboards at home. Ask the following questions: Why do you think we have so many foods that have been changed or processed? Do we need processed foods? Why are some people's favourite foods called "junk foods"?

2. Have your students study a "food processor" such as a baker or a worker in a dairy or a pizza parlour. This can be done as follows: Visit a bakery or use films to outline the duties, processes, materials, and people involved in baking bread. Let the students be processors (make bread). Follow a recipe together, and while the dough is rising or cooking, have the children illustrate the process the baker uses in a bread-shaped booklet.

3. Some processed foods that are being developed are very nutritious. For example, the National Research Council's Prairie Regional Laboratory in Saskatchewan has developed techniques for isolating and utilizing the protein content of the field pea. Several possible food products using pea protein have been developed by the Prairie Regional Laboratory and the Saskatchewan College of Home Economics. When laminated in sheets, pea protein makes a meat-like product; when crumbled, it acts as an extender for meats. This protein concentrate is being used by Saskatoon bakeries to produce breads that qualify as good, or excellent, protein sources.

An interesting product is the "pea chip", which is made from pea flour. With four times the protein content of potato chips, the pro-chips could become a competitive product in today's snacking society.

Have your students discuss why or how food research is important to today's world.

Related Ideas

1. Have your students try to find or create snack foods that are not processed foods. Here is one example:

Bonzies

2 large, ripe bananas — 250 mL ground nuts
30 mL honey

Mash bananas; mix in nuts and honey. Form small balls and roll in additional ground nuts or ground sesame seeds.

Source: Maureen Wallace, *Kick the Junk Food Habit with Snackers* (Vancouver: Douglas and McIntyre, 1977), p. 133. Reprinted by permission.

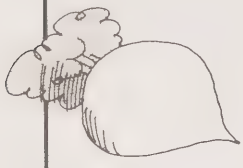
Make groups of children responsible for bringing snacks (nothing processed) to school to share with the rest of the class for recess treats. Encourage raw and/or sugarless foods.

2. Have children pretend to work in a factory assembly line, dramatizing the creation of a TV dinner. Allow only one job per student. (List all of the necessary steps first.) If you have enough students left to be the audience, ask them after the dramatization if they think a TV dinner is an easier and faster way to eat!

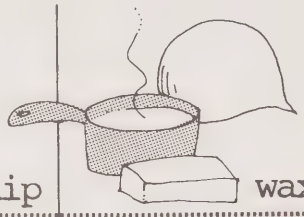
Name:

Storing Food

Can we save energy? Why or why not?



turnip



wax

frozen

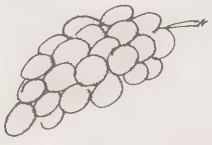
sand box in basement

onion

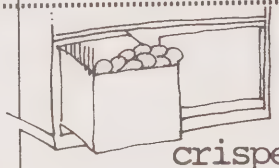
hanging in a dry place

in the fridge

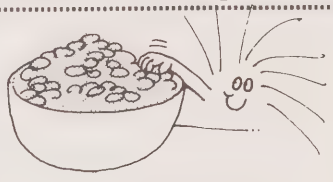
onion flakes



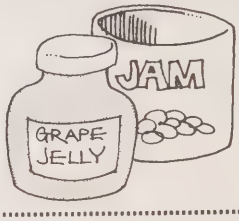
grapes



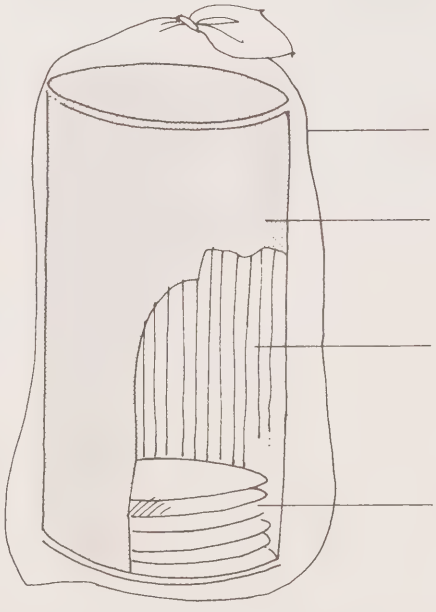
crisper in fridge



raisins



Is this the wisest way to store potatoes?



At home:

Look into your cupboards at home. On the back of this sheet, draw <u>two</u> foods that have "extra" storage wrapping.

Notes

The storage or preservation of our food can easily be overlooked when considering energy uses in the home. Refrigerators and freezers, however, rank with the stove when it comes to large energy converters in the kitchen. Each time food is placed in the refrigerator, unless it is frozen, energy is required to take the heat out of the product until it reaches the set temperature. Through this activity set, students will become more familiar with preservation methods for food and more aware of energy-consuming storage practices.

Students can feel the heat given off by a refrigerator by putting their hands near the bottom of a refrigerator when it is running. Ask them for ideas on how to use a refrigerator properly, what foods should be stored there, and so on. The following are a few suggestions:

1. Many foods that are placed in the refrigerator can just as safely be put into a cupboard.

2. If cooked foods are cooled before they are put into the refrigerator, energy will be conserved.

3. If we avoid opening the refrigerator door unnecessarily, or holding it open while we make choices or sandwiches, we can reduce the workload of the compressor.

As a user of energy-intensive appliances, the student should be able to observe his/her own behaviour when using these appliances in order to modify some of the developing habits.

Students can explore many ways of storing foods (e.g., salting, canning, preserving, freezing, drying, dehydrating, refrigerating, smoking, and waxing). Some techniques will be preferred over others for their convenience, but students will need to consider the "trade-offs" involved in their choices. For each technique, have students consider the following questions: What energies are used? What material resources are wasted? Can the package or container be reused?

The pictures on the student activity sheet can be used to discuss the various methods we use for the storage of our food. Children can later make an individual choice about the methods and decide which ones save the most energy. They can also examine the way one or two foods are stored in their own homes.

Follow-up Activities

1. Let your class experience some food-storing methods first-hand:

a) In the fall, store (by preserving, storing in sand, waxing, etc.) some readily available vegetables and fruits. (This is especially appropriate if the foods are taken from the children's own home gardens.) Use the stored produce in eating and cooking activities later in the winter.

b) Let your students taste samples of preserves, dried foods, etc. Question the children on the energies involved in the various storage methods and discuss the uniqueness of flavours, textures, and aromas that accompany particular preservation methods. For example, compare freezer strawberry jam to preserved (with sugar) strawberry jam in terms of the amount of work involved, materials needed, storage lifetime, and flavour.

2. The spoilage of food caused by micro-organisms and simple chemical changes is prevented or inhibited by additives and preservatives. Flavourings, colourings, flavour enhancers, thickening agents, sweeteners, and so on are listed in descending order of quantity on the labels found on foods.

INGREDIENTS: STARCH, GLUCOSE SOLIDS, SALT, CHEESE, (MILK POWDER, BACTERIAL CULTURE, RIPENING FERMENT, DISODIUM PHOSPHATE, COLOUR), DEHYDRATED TOMATO AND ONION, SPICES.

INGREDIENTS: NOODLES, SALT, MALTO DEXTRIN, MONOSODIUM GLUTAMATE, CHICKEN FAT, HYDROGENATED VEGETABLE SHORTENING (MAY CONTAIN PALM OIL), DEXTROSE, HYDROLYZED MILK & PLANT PROTEINS, POWDERED MECHANICALLY DEBONED CHICKEN MEAT, DEHYDRATED ONION & PARSLEY, WHEAT STARCH, CORNSTARCH, VEGETABLE SHORTENING, SPICE AND SPICE EXTRACTIVES.

In 1971 manufacturers added an estimated 800 million pounds of chemicals to our food in order to prolong its shelf life or alter it cosmetically.

Source: Maureen Wallace, *Kick the Junk Food Habit with Snackers* (Vancouver: Douglas and McIntyre, 1977), p. 133. Reprinted by permission.

At first, focus student attention on only two substances – first, refined sugar in all its disguised forms (dextrose, glucose, and other "-ose" words), and second, nitrates and nitrites. (Salt is another ingredient that may be explored later on.)

Students will understand the many evils of sugar but might not recognize it by its other names.

Nitrates and nitrites interfere with the iodine metabolism of the thyroid gland, decrease the blood's ability to carry oxygen, and deplete the infection-fighting vitamin A supply, because the body cannot convert carotene to vitamin A when any amount of nitrate is present. These chemicals are present alone or together in most cured meats, including ham, bacon, lunch meats, weiners, and many others.

Have students read labels to find out what they are eating! Have them list five foods containing sugar and five foods with nitrates/nitrites. Can they avoid eating some of these foods?

In addition to content labels, point out to students the "best before" stamps that appear on most food products.

3. Have your students investigate some of the ways in which stores used to package food. They can interview older people, asking questions like the following:
a) How were cheese and meat packaged?
b) Did soda come in disposable bottles?
c) Were containers made of plastic?
d) What kind of container did milk come in?
e) Were there many frozen foods? If there weren't, why not? (Do frozen foods use a lot of packaging?)
f) How were hardware stores different than they are today? Were items packaged differently?

Related Ideas

Students can explore any of the following questions:

1. How does the body store energy?

2. How do animals store energy? (e.g., in body fat, hide their food)

3. How do plants store energy? (e.g., tree stores food in roots in winter, seeds)

4. What do astronauts eat? How do they store their food?

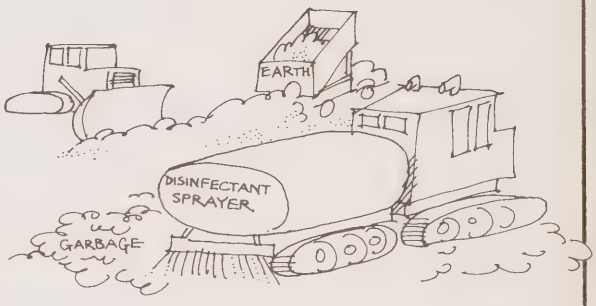
Name:

Where Does All the Garbage Go?

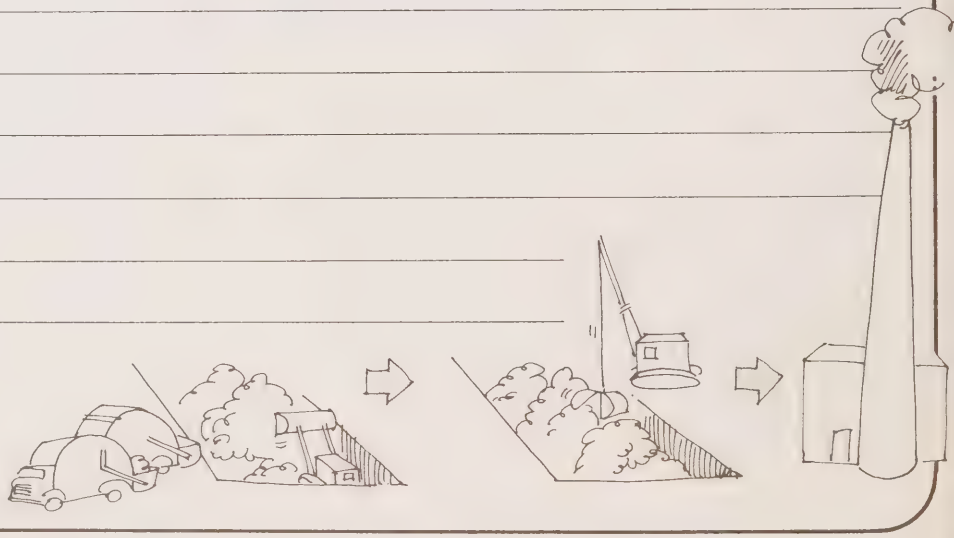
On the lines, write a story about each way of getting rid of garbage.

Open-Pit Dump

Sanitary Landfill



Incinerator

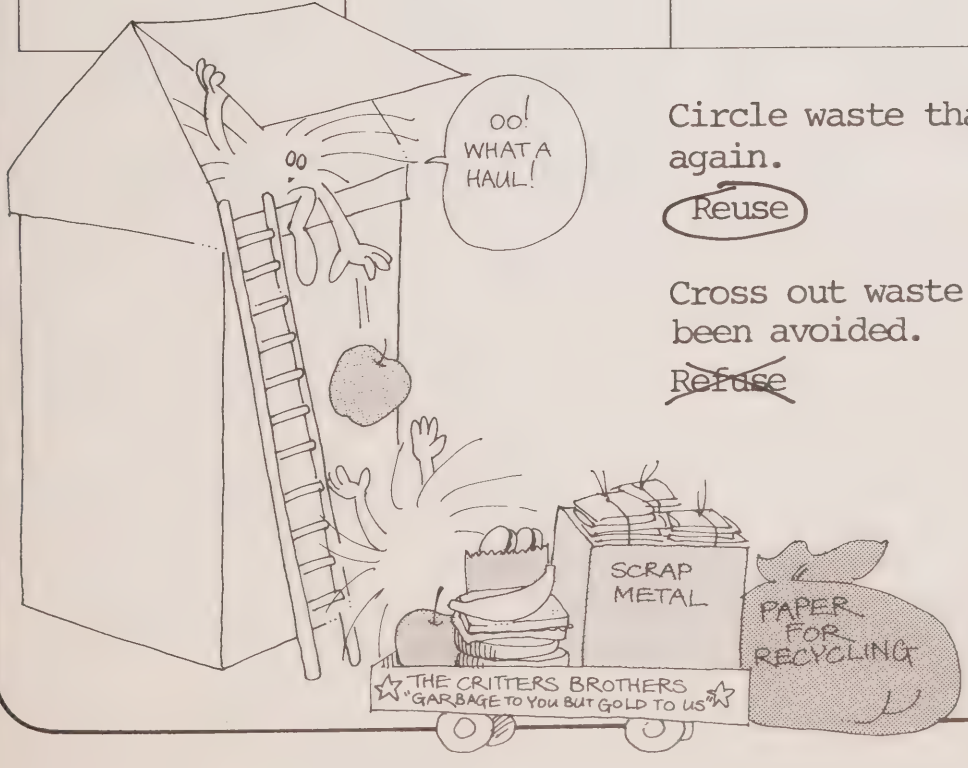


Name:

Waste - School Lunches

Chart the waste from lunch at your school.

Paper	Food	Glass or Metal	Other Material



Circle waste that could be used again.

Reuse

Cross out waste that could have been avoided.

~~Refuse~~

Notes

Garbage cans, plastic bags, boxes overflowing with paper, cans, plastic, orange peels, and coffee grounds. Trucks rumbling along the street in the early morning, groaning and squealing as the garbage is crushed inside. Garbage collectors calling to each other as they toss rattling cans back onto city lots. These sights and sounds are very familiar to city kids. But what happens to the garbage after it's thrown into the trucks? In this activity set, students will develop an awareness of garbage or solid-waste problems, and an understanding of the energies involved in garbage production, disposal, and reuse.

Students can become aware of the quantities of garbage that they produce on a daily basis and of the possible alternatives available. (Three R's: recycle, reuse, refuse.)

Solid waste involves more than just garbage from our schools and homes. There are large amounts of industrial and agricultural solid wastes, as well as wastes from energy production.

It takes energy to extract, manufacture and transport all the products we consume – food, clothing, containers, paper and furniture.

A refillable soft-drink bottle that makes an average of 12 trips (including washing and transportation) can save about 53% of the energy needed to make the same number of throw-away bottles.

Source: Energy, Mines and Resources, *The Garbage Book* (Ottawa: Supply and Services Canada, 1977), p. 6. Reprinted by permission of The Minister of Supply and Services Canada.

Recent waste generation rates for several cities illustrate a significant upward trend. People in Ontario are discarding an average of 2 kg of garbage a day, with estimated growth rate of 7% a year.

Source: Ibid., p. 11.

The Ontario Economic Council stated that the amount of solid waste generated in Canada in 1971 was sufficient to build a four-lane highway raised three feet above ground level stretching from Toronto to Vancouver.

Source: Ontario Economic Council, *Municipal Waste Disposal* (Toronto: Ontario Economic Council, 1972), p. 1. Reprinted by permission.

Students will quickly understand the unpleasant, polluting qualities of garbage. With direction, they can also gain insight into the vast quantities of garbage created by domestic use/misuse. The suggested activities will provide students with an overview of the waste-disposal system and give them some idea of how to make wise energy-saving choices. They will also see how both nature and humans deal with garbage.

Commandeer the school garbage containers after lunch one day. Protect the classroom floor with plastic sheeting and have the students sort the waste into the categories indicated on the chart (i.e., paper, food, glass, metal, and other material, usually plastics). The students who do the sorting should use rubber gloves. As the sorting proceeds, the students can comment on wastefulness, odour, and quantities.

When the garbage is classified, discuss with the class what will happen to the different materials at a dump. (Some will decompose; some won't.) As well, discuss ways to decrease the amount of garbage being produced each day at school and follow up on these ideas.

Now that you have most of your classroom covered in garbage, plan with the students the most effective way of disposing of it:

a) *Reuse* as much of the garbage as possible. Design decorated pencil crayon containers; create garbage sculptures in art; share some of your reusables with other classes.

b) *Recycle* any of the leftover food. Use a meat grinder or blender to make instant composted fertilizer. Add water to the fine food particles and feed the nutritious blend to plants in the school, or mix the instant compost with soil and plant some slips.

c) *Refuse*: Decide together which garbage items could have been avoided and design posters to promote these ideas. Display both the waste charts and the posters in the lunch room.

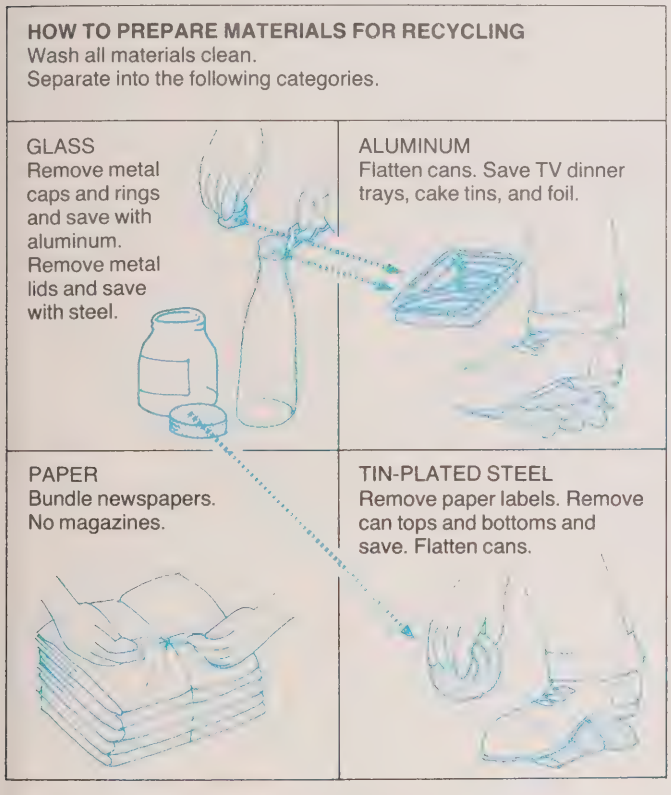
Back to the basics – the 3R's: Reuse, Recycle, Refuse

Follow-up Activities

1. Try to visit a landfill site or an incinerator if possible. There are several films available about solid waste which will show students how we are presently dealing with our garbage. Students can use the first activity sheet to note what happens at open-pit dumps, landfill sites, and incinerators.

On the back of their sheets, students can list possible ways to solve our garbage problems in the future. These might include: recycling glass, tin, and paper; using solid waste as a fuel substitute that is burned either by itself or with coal or oil; sorting garbage and making collections until a use *is* created (after articles go to a landfill site they usually are too contaminated to be of use); recycling clothes and furniture; buying things that will last a long time; only buying pop in returnable containers; and so on.

Table P2.3: How to Prepare Materials for Recycling



Source: Environment Action Coalition, *It's Your Environment* (New York: Charles Scribner's Sons, 1976), p. 55. Reprinted by permission.

2. Have students plant a garbage garden at school to examine first-hand the decomposition process. They can "plant" items from the school's garbage and from their own kitchen garbage (plus a few of your additions). Map the location of particular things in this mini-landfill site, and have students dig it up several months later to note any changes. Make sure to choose an out-of-the-way location or to disguise your site so that only "nature" works on your project.

3. Have each student count and graph the number of garbage bags, boxes, and containers put out for collection at his/her home for a month. How much garbage does each student's family produce in a year? How much is the whole class producing? Try the action plan suggested in *The Garbage Book* of putting Garbage Gus (a nickname for a garbage container) on a diet. Each student should weigh Garbage Gus each collection day and record the results, as his/her family tries to reduce garbage and save energy. Free Garbage Gus posters may be obtained from: Office of Energy Conservation, Energy, Mines and Resources Canada, 580 Booth Street, Ottawa, Ontario K1A 0E4.

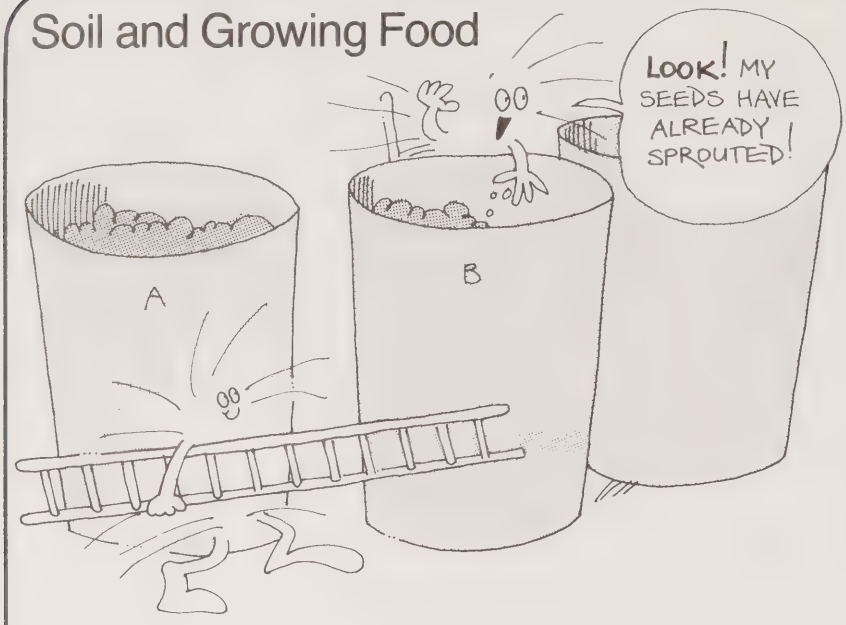
Related Ideas

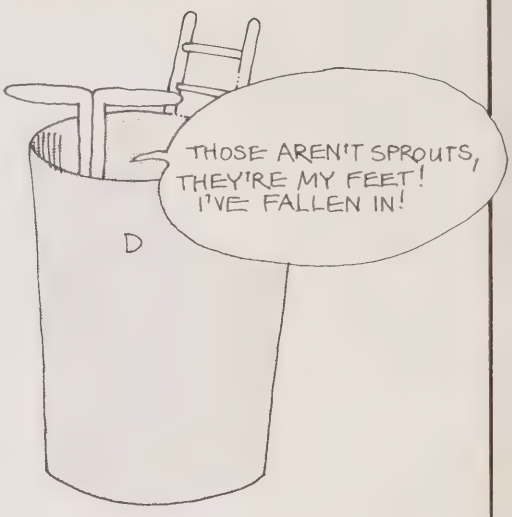
1. Conduct a brief daily discussion on a chosen piece of garbage (e.g., a pop can), including where it is each day and how it is affecting the environment. Trace its journey from a home garbage can to its end (many possibilities).

2. Have all the paper waste collected in your class for one day stretched flat on a bulletin board. It makes a great graphic illustration of how quickly garbage collects.

Name:

Soil and Growing Food





My Plant Growth Chart	A	B	C	D
came up first				
soil stayed moist				
soil needed more water				
grew poorest plants				
grew the best plants				

Adapted from Duane K. Altig (ed.), Energy and Conservation Education, Grades 4-6, (Portland, Oregon: Energy and Man's Environment), p. 174.

Notes

In this activity set, students will observe the effects of soils, composts, and fertilizers on plant growth. They will benefit from the background provided in activity sets 2 and 9. The following experiment will show students that plants obtain energy from another source besides the sun – namely soil. Students will be asked to make combinations of soils and to observe how well each combination is able to retain water and stimulate growth.

Students can be shown examples of organic and inorganic fertilizer – organic referring to natural materials, usually composted or decomposing, and inorganic referring to artificially produced chemical combinations, mainly petroleum-based.

Artificial fertilizers are energy-intensive products which require labour, machinery, natural resources, packaging, transport, etc. Nitrogen is the most important element in fertilizers. Each ton of nitrogen applied to the soil has an energy requirement of about 1.8 tons of oil equivalent.

Source: Adapted from Gerald Leach, *Energy and Food Production* (Guildford, Surrey: I.P.C. Science and Technology Press, 1976), p. 71. Reprinted by permission.

By performing the following experiment, students will be better able to appreciate the potential value of home-composted materials and might be motivated to continue the activity at home. Help your students understand how the concepts introduced here relate to food production on a much larger scale.

Discuss soil as a growing medium, and discuss various types of soil, such as sand, loam, and clay. Students should feel and describe the appearance and texture of each basic kind of soil. Have them identify some examples of natural, organic fertilizers, perhaps some bone-meal-manure compost, as well as a commercially prepared fertilizer. Perhaps your students can report on the fertilizers that they have seen used on a garden.

Prepare *one set* of soil mixtures together as a class, with as much student involvement as possible. You can add the ingredients, while your students stir them together. Make your students responsible for individual record-keeping of plant growth, using the activity sheet.

Note: You might wish to do follow-up activity 1 on composting beforehand.

Follow-up Activities

1. Compost is the breakdown of food and garden wastes into a soil conditioner. Have your students make their own compost. They will need:

- uncooked *food scraps* – no meats and fats
- *green materials* – lawn clippings, leaves, flowers (no weeds)
- a *commercial starter* packet of *Fertizan*
- *earth*, which will go between the layers of organic "goodies"
- a large plastic garbage container, several dowels or sticks (each the height of the container)

The compost can be made according to the following instructions:

- Put a layer of organic material in the bottom and sprinkle it with the compost starter, then a layer of earth. Moisten and add successive layers of organic material and earth.
- Insert the dowels or sticks into the organic materials as soon as possible. When the container is nearly full, remove the sticks so that you have chimneys or shafts of air for ventilation.
- Store in a well-ventilated area (outside in spring).
  The compost will be ready in three to five weeks. It will be a dark, rich colour! Use it in the school's flower beds.

2. Bread and fruit peelings can be used to demonstrate how air and water affect the decomposition process. Have your students put a piece of bread and a piece of dry peeling into each of two plastic bags and seal the bags. Another piece of bread and a piece of peeling are placed in a moistened towel, and left for a couple of days. Ask the children how decay changes the size, smell, and colour of the food items. Students can try growing other kinds of moulds. Be sure to provide several pairs of thin plastic gloves for the children to use in these experiments.

3. Take your students on a neighbourhood walk to look for evidence of decomposition occurring in nature (e.g., fungi, the work of insects).

4. Using picture or filmstrip aids, discuss with your class the various climates of the world and the kinds of food that are produced in each (e.g., bananas and citrus fruits need tropical climates). Students should be aware of the major production country of at least two foods.

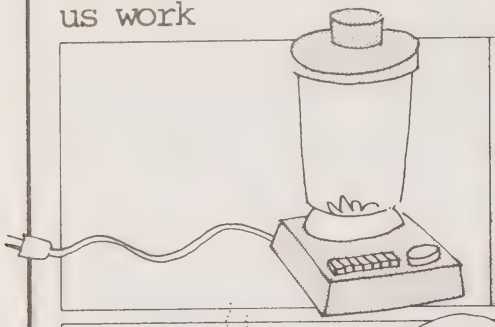
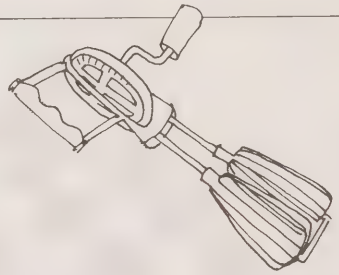
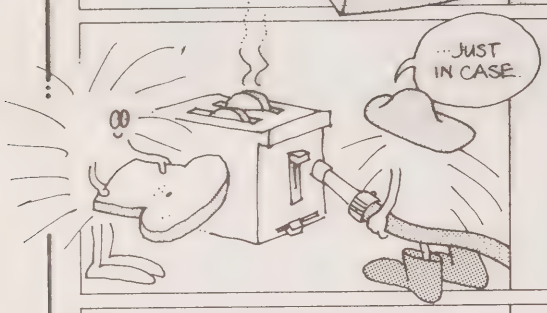
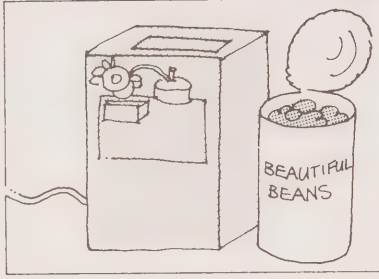
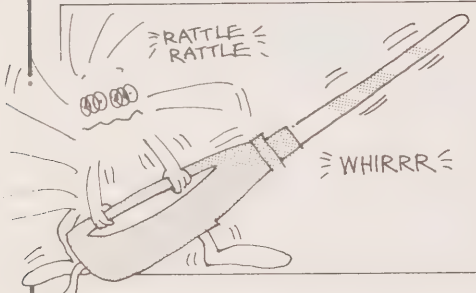
Related Ideas

Students can attempt any or all of the following activities:

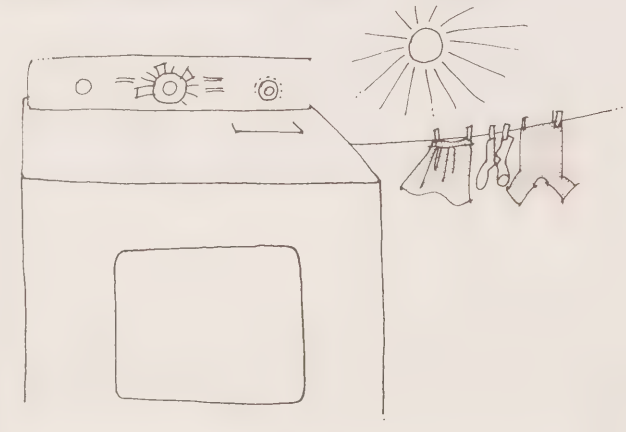
1. Interview a horticulturalist about his/her work.
2. Visit a greenhouse or a park to appreciate the plants.
3. Beautify your school – plant a garden!
4. Make a survey of the plants grown in your home.
5. Study "meat-eating" plants. Many florists have Venus's-flytraps available at reasonable prices. Find out about this plant's needs and how it functions.
6. Plants and flowers are used on special occasions. Note the types of plants used in festive celebrations and their significance (e.g., the poinsettia at Christmas and the lily at Easter).

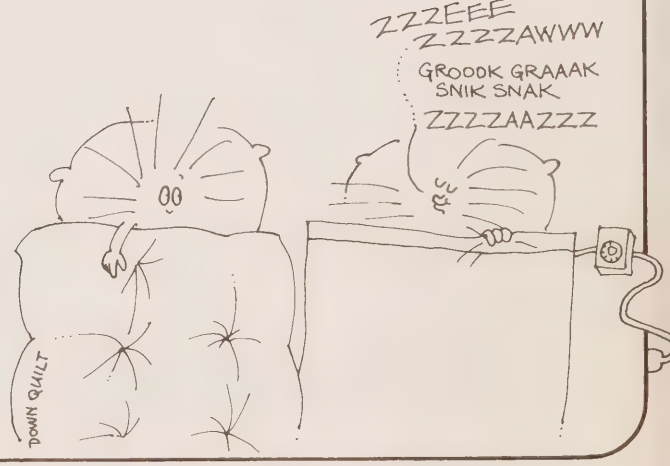
Name:

Do We Need It?

Things that help us work	Another way to do it	Do we need it? Why? Why not?
		
		
		
		

Which requires more energy?





Notes

In this activity set, students will examine appliances and their function in food preparation. They will examine alternative energy-conserving techniques in order to be better able to decide on the total usefulness of some resource-intensive kitchen appliances. The activities should make students more aware of the quantity of "limited-use" electrical appliances that Canadians are purchasing in ever-increasing numbers. Many of these kitchen servants help get the job of food preparation done more quickly and easily, but others have very restricted functions and remain stored in cupboards for months on end.

Electrical kitchen devices usually require more resources to construct; create more waste in the form of advertising, packaging, transporting, and production pollutants; and obviously use more electrical energy to operate than the hand utensils that accomplish the same tasks. For example, an electric knife performs no additional services over a sharp, single-blade carving knife, yet requires two metal blades, a plastic instead of a wooden handle, plastic and wire for the cord, often a special plastic carrying case, *and* electrical power to render the whole thing usable.

In evaluating the power required by electrical appliances, we should not be sidetracked by the low power ratings marked on the devices, but should consider all of the material and energy expenditures required to create and market such kitchen "widgets". The total picture, involving the supply and demand of millions of electrical devices across Canada, is illustrative of a fantastic drain on our country's natural resources. It is to be hoped that if students have an opportunity to consider whether an electrical device is a necessary, hard-working component of a kitchen or simply a publicized convenience tool, they will become wise consumers in the future.

The student activity sheets will introduce kitchen appliances as a topic for discussion. The first sheet ("Do We Need It?") can be completed individually or used to make a transparency to be shown to the whole class at once. Students can use the backs of their first sheet to consider other kitchen gadgets that might be very energy-intensive to produce. They might draw or find pictures from catalogues to show some inefficient and some efficient kitchen tools.

Follow-up Activities

1. Have the students record on a checklist (like the following sample) for one week how many times a particular appliance was used (normal family use). Discuss ways to obtain family cooperation for this task. Have the students include in their lists those tools they consider necessary and some that they feel are merely convenience items.

Table P2.4: Portable Electric Appliances – Checklist

Appliance Name	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1. Toaster	√√	√√		√√√√			
2. Carving knife							√
3. Popcorn popper					√		
4.							
5.							
6.							
7.							
8.							

2. Have the students list the electrical appliances they have at home. This can be restricted to the kitchen, and a limit set at, say, fifteen. On the next day, have the students decide which devices are *necessary* and which are *convenience* items. Their responses and reasons will vary.

3. Students can locate appliance advertisements in magazines and newspapers. They can also keep track of appliance commercials that they hear or see on radio and television. After reviewing some of the more famous commercials, students can try to sell alternative food-preparation items. For example, they can advertise one or two models of graters by designing posters that expound on their performance, price, durability, etc. Your students might also like to try making TV commercials about their products.

Related Ideas

1. Have your students make two bowls of coleslaw or grated salad using a blender for one and a grater for the other. Both should be refrigerated for a few hours (to blend flavours). Have the students taste a sample of each and answer the following questions: What conclusions can be drawn from the observations made? *Is* one method better? Was the blender really an easier way to prepare food? Do we use energy when all the work is done by hand?

2. Have your students make a study of words used by advertisers to convince people that a product should be bought. They can use magazines, catalogues, newspapers, television, and radio to examine the "selling" vocabulary. Phrases such as "new and improved", "special edition", "automatic", "deluxe", "all-purpose", and "amazing" are all common examples. Students can search out and list these words on a large chart. The list of words or phrases can then be used to study phonetic elements, vowel sounds, or syllables.

Students can play with these words in sentence-building exercises. They can begin with a statement and then add modifiers as in the following examples:

"Jack scooped the ice cream with a special spoon."

- special
- new, improved
- xeron-coated
- all-purpose
- dishwasher-safe

"I washed the dishes."

- oven-proof
- duraware
- hand-painted
- unbreakable
- country-designed

3. If some discarded appliances can be obtained for class use, dismantle them so that the children can examine all that is involved in an appliance's production and functioning. Perhaps new creative models can be assembled from the leftover parts.

4. Examine with your class the packaging and the quantity of packaging materials for one or two appliances, especially ones with breakable parts. Department stores are usually cooperative and can supply packaging for displayed items for a few days.

5. Have your students examine different kinds of pots, looking for different metals, coatings, the shape of bottom surfaces, and how the lids fit. Ask them which will work most efficiently and why.

6. Have students make a list of all the electrical appliances found in other parts of their homes. At school, children can evaluate the usefulness of each and indicate essential appliances with a star, unnecessary appliances with a cross, etc.

Name:

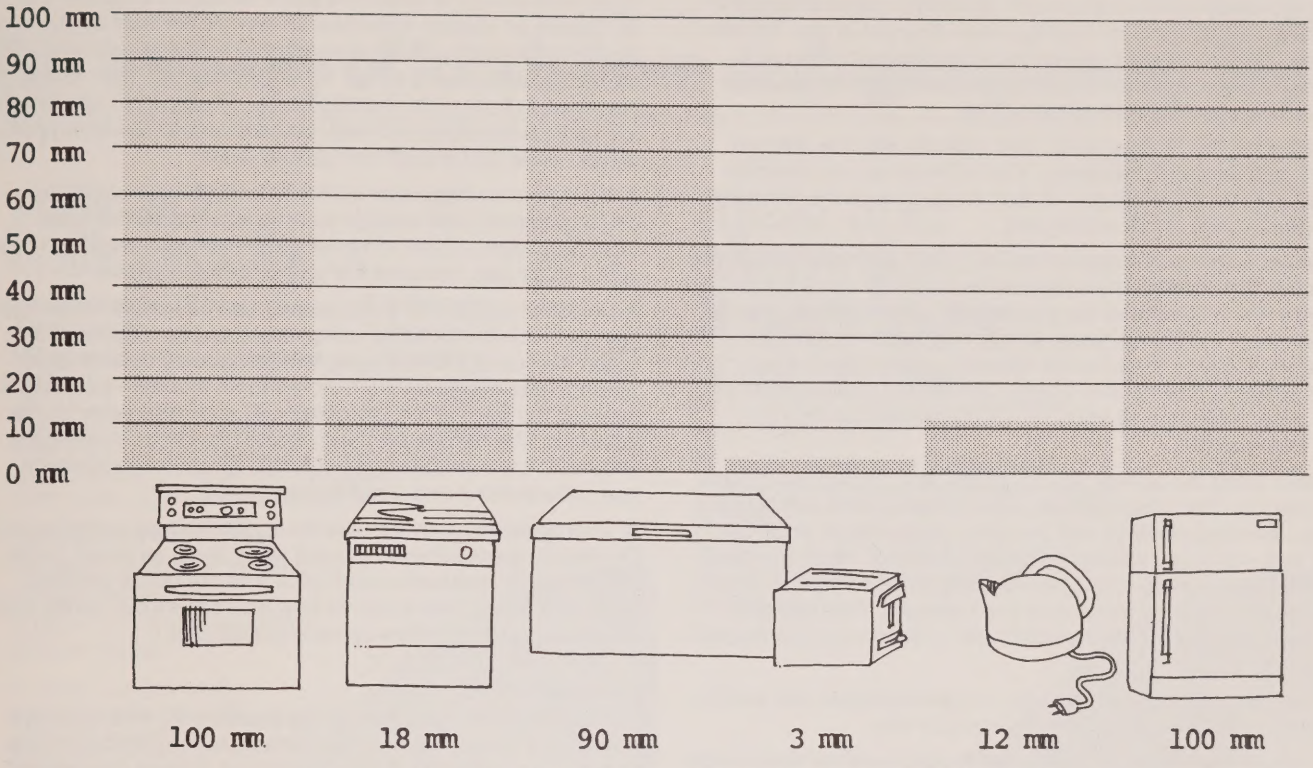
Energy Eaters

Who is using the most body energy?
Circle two boxes.

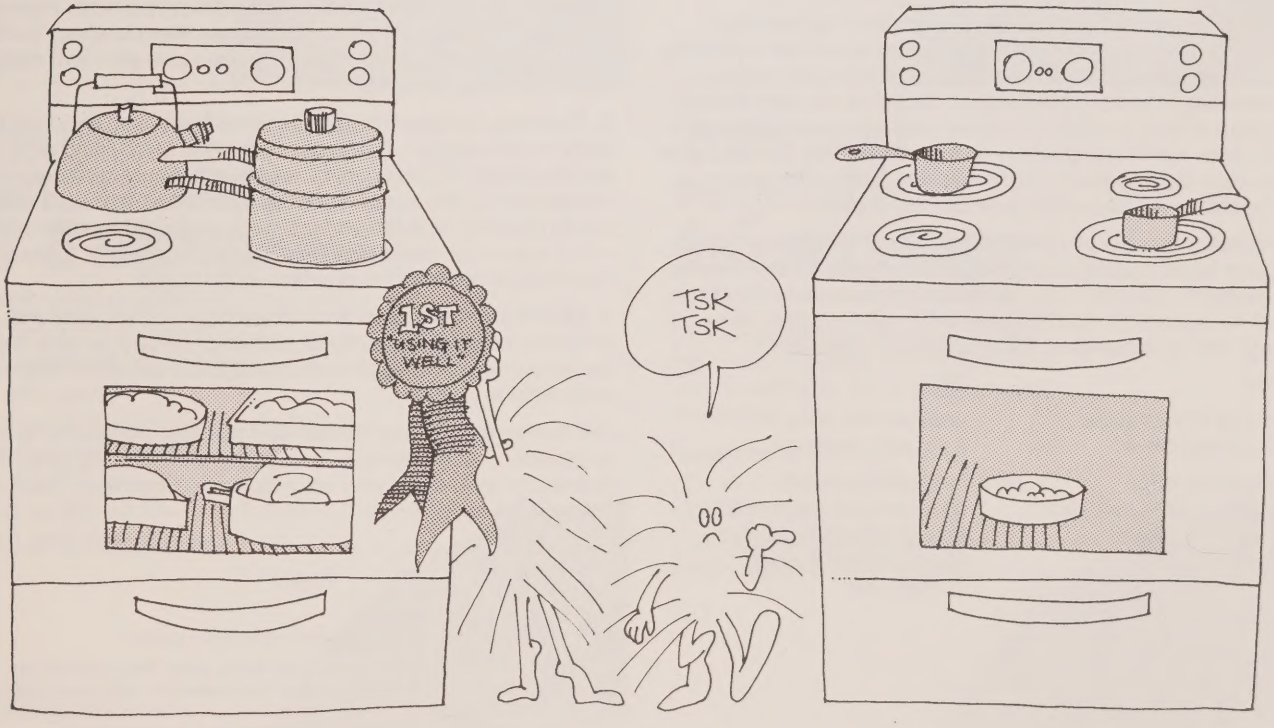
Draw a line from each bear to his or her porridge bowl.
Why does papa bear need more porridge than baby bear?

Name:

Look for Energy Eaters



Can we save energy?



Draw pictures of other ways to conserve energy on the back of this sheet.

Notes

The kitchen, where our food is prepared, is one of the biggest energy-using rooms in the house. Students can be assisted in finding ways to conserve energy when they are in the kitchen. They should become more aware of the large energy-using appliances in the kitchen and become better informed on efficient ways to utilize these appliances.

Children at the Primary level have difficulty with the abstract concepts related to electricity. You will need to use concrete examples and/or analogies to help students with the ideas presented in parts of this activity set.

The bar graph on the student activity sheet attempts to illustrate the average monthly electrical consumption for several appliances. Each bar shows the average monthly electrical energy conversion in kilowatt hours. (A kilowatt hour is an amount of electrical energy equal to one kilowatt supplied for one hour.) For example, the monthly energy conversion in kilowatt hours for a dishwasher is 18 kW·h, which is represented by a bar 18 mm in length.

Before using the activity sheets, obtain and display two groups of pictures. One group should show people at very active tasks (e.g., working, playing), and the other group should show people relaxing (e.g., reading, watching, sleeping). Have the class decide which group of people are going to be very hungry (because they've been using their body energy). Your students should understand that different tasks require varying amounts of energy.

Draw a large car and a small car on the chalkboard and ask the children which uses the most energy and why.

Use pictures of an adult and a child to help students decide who has the greatest food energy needs. You might compare your food requirements to those of one of your pupils. Then use the activity sheets to help students understand that different appliances use different amounts of electrical energy.

Students should become aware of one or two high-energy-using appliances and work out ways to use these items properly and efficiently. Many leaflets and books offer helpful hints on economizing (see the bibliography). Students can also involve members of their families in working out ways to save energy in the kitchen. Ask them to work with their families to make a list of three ways to save energy in the kitchen. Some of these ideas can be drawn on the back of their activity sheets.

Ask questions and guide students to identify wasteful practices and then to set realistic energy-conscious goals for themselves. For example, you might put "either/or" sentences on the chalkboard for students to study. These will in turn suggest ideas for energy-saving behaviours. Here are some examples:

Either	*Or*
I will cook this soup in a pot without the lid.	I will boil this soup in a pot with the lid on.
I will boil the kettle for both my sister and me, and we will make hot chocolate.	I will boil the kettle now because I'm ready for my hot chocolate, and my sister can boil it again for hers later.

Follow-up Activities

1. How much is a lot? Students can gain an appreciation of just how much energy is used by a kettle through the following activity. Obtain an electric kettle and an electric portable heater having identical power ratings (usually 1500 W). Put cold water in the kettle. Set a student (at a safe distance, but close enough to feel heat) in front of the electric heater. Plug in both appliances. By the time the water is boiled, your very warm student will let people know that a lot of energy was used!

2. How does a refrigerator work? Trace with your class the development of cold-storage techniques through the ages. Then, with illustrations and analogies, help your students understand about gas, compressed gas, and heat transfer.

A simplified diagram of a refrigerator can be used to show how energy is used to work the compressor and fan. Students will grasp the concept of changing temperature by cycling liquid around, absorbing heat from stored food, and then pumping the heat out the back of the refrigerator. A good reference for this activity is *The Refrigerator and How It Works* by David Inglis Urquhart. It is available at most public libraries and contains many illustrations and simplified language.

3. Energy-saving activities can be applied to transportation too. Our food is transported in several ways, such as boats, trains, trucks, refrigerated cars and trucks, and our family vehicles (cars and bikes). Ask students how we can use our family vehicles more wisely. (Follow up on only one idea.)

Related Ideas

1. Have students trace the energy source from their electrical appliances to the outlet, to the fusebox, to the distributing station, to the generating station, and so on. A good diagram will help. By doing this, students can perhaps appreciate the complex electrical network of a city.

2. One-pot meals and oven meals, e.g., macaroni and cheese, stew, pot roast and vegetables, are both economical. Have your students plan a few of these. Encourage them to share their menus with their families. Can they eat a one-pot meal once a week? Set this as a goal.

3. Students can grow moulds on some foods and examine them under a microscope. These are one of the plant organisms that spoil our food. Moulds cannot readily grow in cold places (i.e., refrigerators). Have your students take two of the foods with mould growing on them and put them under different conditions – one in a warm, moist place and the other in a cold, dry setting. Ask them to observe the changes in the foods.

4. All milk contains lactic acid and bacteria. Given time and proper conditions the bacteria feed and multiply. In time, the bacteria produce enough acid to coagulate the milk. This semi-solid state is yogurt.

Our bodies (intestines) contain and use tiny organisms, similar to moulds, called "bacteria", which are similar to the ones used to make yogurt. Make and eat yogurt with fresh fruit. The following recipe is a good one:

Yogurt

To make 1 L of yogurt:
1 L of milk 40 mL of yogurt (commercial variety)

Heat milk until it almost reaches the boiling point. Pour into earthen bowl. Cool until it is slightly warmer than lukewarm. Add yogurt (room temperature), stirring gently. Cover bowl and place on warm blanket. Wrap blanket around bowl and let stand for at least five hours. Place in refrigerator.
Add crushed fruit or berries; or syrup or honey before eating.

Source: Adapted from Olga Smetinoff, *The Yogurt Cookbook* (New York: Frederick Fell Publishers, 1966), p. 2. Reprinted by permission.

Canada's Food Guide

Eat a variety of foods from each group every day

Energy needs vary with age, sex and activity. Foods selected according to the guide can supply 1000-1400 calories. For additional energy, increase the number and size of servings from the various food groups or add other foods.

milk and milk products

Children up to 11 years	**2-3 servings**
Adolescents	**3-4 servings**
Pregnant and nursing women	**3-4 servings**
Adults	**2 servings**

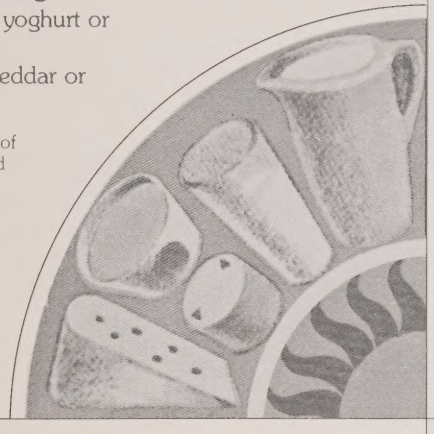
Skim, 2%, whole, buttermilk, reconstituted dry or evaporated milk may be used as a beverage or as the main ingredient in other foods. Cheese may also be chosen.

Examples of one serving

250 ml (1 cup) milk, yoghurt or cottage cheese

45 g (1½ ounces) cheddar or process cheese

In addition, a supplement of vitamin D is recommended when milk is consumed which does not contain added vitamin D.



meat and alternates **2 servings**

Examples of one serving

60 to 90 g (2-3 ounces) cooked lean meat, poultry, liver or fish

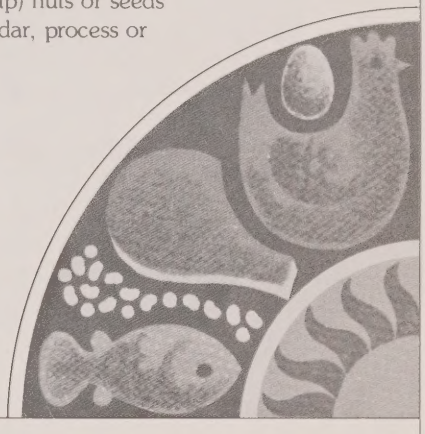
60 ml (4 tablespoons) peanut butter

250 ml (1 cup) cooked dried peas, beans or lentils

80 to 250 ml (⅓-1 cup) nuts or seeds

60 g (2 ounces) cheddar, process or cottage cheese

2 eggs



bread and cereals **3-5 servings**

whole grain or enriched. Whole grain products are recommended.

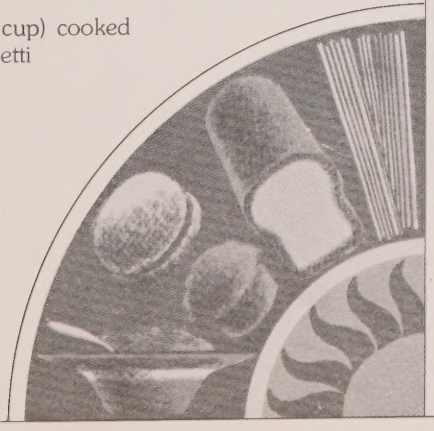
Examples of one serving

1 slice bread

125 to 250 ml (½-1 cup) cooked or ready-to-eat cereal

1 roll or muffin

125 to 200 ml (½-¾ cup) cooked rice, macaroni, spaghetti



fruits and vegetables **4-5 servings**

Include at least two vegetables.

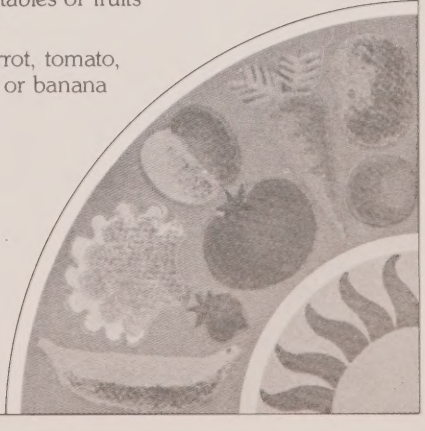
Choose a variety of both vegetables and fruits — cooked, raw or their juices. Include yellow or green or green leafy vegetables.

Examples of one serving

125 ml (½ cup) vegetables or fruits

125 ml (½ cup) juice

1 medium potato, carrot, tomato, peach, apple, orange or banana



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